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Limited and Uwe Maass

UNITED STATES DISTRICT COURT
DISTRICT OF NEVADA

HOLOGRAM USA, INC., a Delaware corporation;
MDH HOLOGRAM LIMITED, a corporation
organized under the laws of the United Kingdom;
and UWE MAASS, an individual,

Plaintiffs,

v.

PULSE EVOLUTION CORPORATION, a Nevada
corporation; PULSE ENTERTAINMENT
CORPORATION, a Delaware corporation; JOHN
C. TEXTOR, an individual; DICK CLARK
PRODUCTIONS, INC., a Delaware corporation;
JOHN BRANCA and JOHN MCCLAIN, Executors
of the Estate of Michael J. Jackson; MJJ
PRODUCTIONS, INC., a California corporation;
MUSION EVENTS LTD., a United Kingdom
private company; MUSION 3D LTD., a United
Kingdom private company; WILLIAM JAMES
ROCK, an individual; IAN CHRISTOPHER
O'CONNELL, an individual; and DOES 1 through
10,

Defendants.

Case No.: 2:14-cv-00772-GMN-NJK

**SECOND AMENDED AND
SUPPLEMENTAL COMPLAINT;
DEMAND FOR JURY TRIAL**

INTRODUCTION

1. In 1862, John Pepper and Henry Dircks invented “Pepper’s Ghost,” an illusion technique, which, over the last 150 years, has appeared in movies, concerts, magic shows and amusement park rides. Many of us have sat with the original Pepper’s Ghost in Disneyland’s Haunted Mansion. Today, thanks to the Plaintiffs’ patented technology, a new incarnation of Pepper’s Ghost has appeared. The patented technology renders three-dimensional images virtually indistinguishable from real-life bodies.

2. Plaintiff Hologram USA acquired exclusive rights to the patented technology directly from plaintiffs MDH Hologram Limited, formerly known as Musion das Hologram (“MDH”) and Uwe Maass, holders of the relevant patents. Hologram USA was created to specifically promote and publicize the type of three-dimensional entertainment only made possible by the Plaintiffs’ patented technology. Recognizing Plaintiffs’ exclusive rights, certain Defendants approached Plaintiffs in April and May of 2014, attempting to license those rights. Plaintiffs refused to grant Defendants any such license.

3. Defendants elected to ignore the rights they previously sought to license. On or about May 15, 2014, it was reported in the press that Defendants planned to misappropriate the Plaintiffs’ patented technology and infringe Plaintiffs’ patents by creating a hologram of Michael Jackson who would “dance across the stage” at the Billboard Music Awards, on May 18, 2014. On that day, without authorization, Defendants employed the Plaintiffs’ patented technology to produce a three-dimensional image of Michael Jackson during the international television broadcast of the Billboard Music Awards. Plaintiffs’ infringing act garnered significant attention around the globe and will continue to do so, as the performance is disseminated online and through other popular media sources.

4. Plaintiffs have never authorized any of the Defendants to use the Plaintiffs’ patented technology. Yet Defendants used that technology on May 18, 2014, to conjure a posthumous performance by Michael Jackson for an audience of millions. Defendants’ willful infringement has damaged, and continues to greatly damage, Plaintiffs. Plaintiffs seek the assistance of this Court to recover damages and enjoin Defendants’ wrongful conduct.

THE PARTIES

5. Plaintiff Maass is a citizen of Germany and an individual residing in the United Arab Emirates. The United States Patent & Trademark Office (“PTO”) issued U.S. Patent No. 5,865,519 (the “’519 patent”) to Mr. Maass on February 2, 1999. Mr. Maass is also the sole named inventor on the ’519 patent. Mr. Maass has owned all rights, title and interest to the ’519 patent since the patent’s issuance.

6. Plaintiff MDH is a corporation organized and existing under the laws of the United Kingdom, having a principal place of business at 90 High Holborn, London, United Kingdom WC1V 6XX.

7. The PTO issued U.S. Patent No. 7,883,212 (the “’212 patent”) on February 8, 2011, to Defendants Ian O’Connell and James Rock, as named inventors. The ’212 patent issued from U.S. Patent Application No. 10/599,553 (the “’553 application”). In September 2006, Defendants Rock and O’Connell, “for good and valuable consideration,” assigned their entire right, title and interest to the ’553 application, including any and all patents granted on any division, continuation, continuation-in-part and reissue of the ’212 patent (the “September 2006 Assignment”), to Musion Systems Limited (“MSL”). On September 26, 2013, MSL assigned “all such rights, title, and interest” in the ’212 patent, including any and all patents granted on any division, continuation, continuation-in-part and reissue of the ’212 patent (the “September 2013 Assignment”) to Plaintiff MDH.

8. The PTO issued U.S. Patent No. 8,328,361 (the “’361 patent”) on December 11, 2012. The ’361 patent issued from U.S. Patent Application No. 13/011,452 (the “’452 application”), which was filed on January 21, 2011. The ’452 application is a continuation of the ’553 application. As a result, the September 2006 Assignment to MSL included Defendants Rock and O’Connell’s entire right, title and interest to the ’452 application and the ’361 patent. The September 2013 Assignment to Plaintiff MDH similarly included the ’452 application and the ’361 patent.

9. By virtue of the September 2013 Assignment, Plaintiff MDH has owned all rights, title and interest to the ’212 patent and the ’361 patent since September 26, 2013.

1 10. Plaintiff Hologram USA, Inc. ("Hologram USA") is a corporation organized and
2 existing under the laws of the State of Delaware, having a principal place of business at 301 N.
3 Canon Drive, Beverly Hills, California 90210. Since February 2014, Hologram USA is and has
4 been the exclusive licensee of the '212 patent, the '361 patent and the '519 patent (collectively, the
5 "Patents in Suit") for all uses except adult entertainment.

6 11. On information and belief, defendant Pulse Evolution Corporation is a corporation
7 organized and existing under the laws of the State of Nevada, having a principal place of business in
8 Port St. Lucie, Florida.

9 12. On information and belief, defendant Pulse Entertainment Corporation is a
10 corporation organized and existing under the laws of State of Delaware, having a principal place of
11 business in Hobe Sound, Florida. Pulse Evolution Corporation and Pulse Entertainment Corporation
12 are referred to collectively as "Pulse."

13 13. On information and belief, defendant John C. Textor is a citizen of the United States
14 residing in Florida. He is the Chairman of Pulse Evolution Corporation and Pulse Entertainment
15 Corporation. Textor was personally involved in infringing the Patents in Suit, and caused, urged,
16 encouraged, and aided in the direct infringement. Among other things, Textor was personally
17 present at the 2014 Billboard Music Awards where Plaintiffs' patented technology was
18 misappropriated to create a holographic-like performance by Michael Jackson. Textor has also
19 attempted to claim credit for a 2012 three-dimensional rendering of rapper Tupac Shakur at the
20 Coachella Valley Music Festival. But Textor had nothing to do with that performance, which had
21 been properly licensed by Digital Domain, Inc. ("Digital Domain"), a company from which Textor
22 was fired. Textor has been credited with leading Digital Domain's collapse. Not surprisingly,
23 Digital Domain has recovered since parting ways with Textor.

24 14. On information and belief, defendant Dick Clark Productions, Inc. ("Dick Clark
25 Productions") is a corporation organized and existing under the laws of the State of Delaware,
26 having a principal place of business in Santa Monica, California. Dick Clark Productions is the
27 producer of the 2014 Billboard Music Awards, which was held at the MGM Grand Hotel & Casino
28 in Las Vegas on May 18, 2014.

1 15. On information and belief, defendants John G. Branca and John McClain are
 2 individuals residing in Los Angeles, California. Branca and McClain have been appointed as the
 3 Executors of the Estate of Michael J. Jackson (the “Estate”). They are sued in that capacity.

4 16. On information and belief, defendant MJJ Productions, Inc. is a corporation organized
 5 and existing under the laws of California, having a principal place of business in Hollywood,
 6 California.

7 17. On information and belief, defendant Musion Events Limited (“Musion Events”) is a
 8 private company organized and existing under the laws of the United Kingdom, having a principal
 9 place of business in Leicester, England.

10 18. On information and belief, defendant Musion 3D Limited (“Musion 3D”) is a private
 11 company organized and existing under the laws of the United Kingdom, having a principal place of
 12 business in London, England. Musion 3D and Musion Events are referred to collectively as the
 13 “Musion Defendants.”

14 19. On information and belief, defendant James Rock is a citizen of the United Kingdom
 15 residing in West Midlands, England. He was and is a director of the Musion Defendants. Rock was
 16 personally involved in infringing the Patents in Suit, and caused, urged, encouraged, and aided in the
 17 direct infringement. Among other things, Rock was personally present at the 2014 Billboard Music
 18 Awards where Plaintiffs’ patented technology was misappropriated to create a holographic-like
 19 performance by Michael Jackson. He also was present during Plaintiffs’ inspection of Defendants’
 20 system after the conclusion of the awards show.

21 20. On information and belief, defendant Ian O’Connell is a citizen of the United
 22 Kingdom and residing in London, England. He was and is a director of the Musion Defendants.
 23 O’Connell was personally involved in infringing the Patents in Suit, and caused, urged, encouraged,
 24 and aided in the direct infringement.

25 21. The true names and capacities, whether individual, corporate, associate, or otherwise,
 26 of the defendants sued in this complaint as DOES 1-10 (collectively, the “Doe Defendants”) are
 27 presently unknown to Plaintiffs, who therefore sue them by fictitious names. Plaintiffs will amend
 28 the complaint to allege their true names and capacities when ascertained. Plaintiffs are informed and

1 believe and therefore allege that all Defendants, which include the Doe Defendants, were or are, in
2 some way or manner, responsible for and liable to Plaintiffs for the events, happenings, and damages
3 alleged in this complaint.

4 22. Plaintiffs are informed and believe and thereon allege that at all times mentioned,
5 each Defendant was the agent, servant, employee, co-venturer, representative, or co-conspirator of
6 each of the other defendants, and acted with the knowledge, consent, ratification, authorization
7 and/or at the direction of each Defendant, or is otherwise responsible in some manner for the
8 occurrences alleged in this complaint.

9 **JURISDICTION AND VENUE**

10 23. This is a civil action for patent infringement arising under the Patent Laws of the
11 United States of America, 35 U.S.C. § 101, *et seq.*

12 24. This Court has jurisdiction over the subject matter of this Complaint pursuant to 28
13 U.S.C. §§ 1331 and 1338.

14 25. This Court has personal jurisdiction over Defendants for at least the following
15 reasons: (i) Defendants regularly do business or solicit business, engage in other persistent courses
16 of conduct, and/or derive substantial revenue from products and/or services provided to individuals
17 in this District and in this State; (ii) Defendants have purposefully established substantial,
18 systematic, and continuous contacts with this District and expect or should reasonably expect to be
19 in court here; and (iii) the Defendants purposefully availed themselves of the privilege of conducting
20 activities within the forum state and the causes of action alleged herein arise out of Defendants'
21 contacts with the forum. Thus, this Court's exercise of jurisdiction over Defendants will not offend
22 traditional notions of fair play and substantial justice.

23 26. Venue is proper in this judicial district pursuant to 28 U.S.C. §§ 1391(b)-(c) and
24 1400(b) because Defendants do business in this District, Defendants are subject to personal
25 jurisdiction in this District, and a substantial portion of the events giving rise to the claims for relief
26 stated in this Complaint occurred in this District.

FACTUAL ALLEGATIONS**A. The Patented Technology**

27. The Patents in Suit cover various amazing techniques for projecting video to create the illusion of life-size, full color, 3D moving images. The images used in these systems are three-dimensional, but are projected as two-dimensional images into a three-dimensional stage set. This technology is capable of creating the appearance of life-size, three-dimensional moving images on stage that are nearly indistinguishable from real people.

28. For example, Maass developed the inventions claimed in the '519 patent after researching an old stage trick called "Pepper's Ghost," originally developed in the 1800s. This illusion was capable of creating the illusion of a ghost on stage. The trick relied, in part, on a heavy pane of glass positioned on stage to reflect the image of an actor positioned off-stage. This trick is still used today, such as at Disney's Haunted Mansion. While Pepper's Ghost is a relatively simple technique for creating an illusion, it is not capable of producing large effects that could move around on a large stage. Before Maass's invention, people had to use technology that relied on 3D glasses to create the illusion of a large three-dimensional moving image on stage or on screen.

29. After studying Pepper's Ghost, Maass invented a proprietary system using a transparent smooth foil, capable of creating the illusion of life-size and three-dimensional images that may move around on a large stage. Importantly, the use of transparent smooth foil is practical to transport and setup on an existing stage and safe in comparison to the glass traditionally used in Pepper's Ghost. The invention also eliminated the need for using 3D glasses.

30. The technology described in the Patents in Suit is known for producing high quality holographic-like projections. In 2006, certain embodiments of the technology were used to create a "live" performance by the animated band Gorillaz at the Grammy Awards. Subsequently, in 2012, pursuant to a license it had obtained from the patent holders at the time, Digital Domain used certain embodiments of the Plaintiffs' patented technology at the Coachella Music Festival to produce a life-size, three-dimensional moving image of deceased rapper Tupac Shakur performing on stage with Dr. Dre and Snoop Dogg. Although defendant Textor continues to claim credit for the Shakur performance, he was not involved in its production; nor was he involved in Digital Domain's

1 licensing of the right to practice the Patents in Suit. It was only after that performance lead to a
 2 surge in Digital Domain's stock price that Textor started to associate himself with the Shakur
 3 hologram.

4 31. In February 2014, Hologram USA outbid Digital Domain to acquire exclusive rights
 5 to the Patents in Suit and other technology. Hologram USA entered into an agreement with Maass
 6 and MDH to acquire these exclusive rights. As a result of the parties' agreement, Hologram USA
 7 became the exclusive licensee to the Patents in Suit in all markets in the United States and Canada,
 8 with the exception of adult entertainment.

9 **B. The 2014 Billboard Music Awards**

10 32. On Sunday, May 18, 2014, the Billboard Music Awards aired live on ABC from the
 11 MGM Grand Garden Arena in Las Vegas, Nevada. The televised awards show included *live*
 12 performances by some of the most popular and up-and-coming entertainers in the world, including
 13 Miley Cyrus, Ricky Martin, Jennifer Lopez, Pitbull, 5 Seconds of Summer, Florida Georgia Line,
 14 Jason Derulo, Imagine Dragons, Luke Bryan, John Legend, OneRepublic, Miranda Lambert and
 15 Carrie Underwood. Most notably, for the first time in history, the awards show also included a
 16 "live" performance by a hologram: The deceased King of Pop, Michael Jackson.

17 33. Ten days before the awards show, on May 8, Billboard issued a press release in
 18 which it promised "to be one of the year's stand-out music events." Although Billboard did not
 19 disclose that a hologram-like image of Michael Jackson would perform at the awards ceremony, it
 20 promised to "raise the bar even higher with a world premier experience featuring the late King of
 21 Pop." It announced that "[t]he Estate of Michael Jackson created the spot, which will present the
 22 superstar 'like you've never seen him before.' It's sure to be a thriller, but the finer details remain
 23 under lock-and-key." See Michael Jackson to Unleash World Premiere Experience at Billboard
 24 Music Awards, Billboard (May 8, 2014, 6:00 AM), [http://www.billboard.com/articles/events/bbma-](http://www.billboard.com/articles/events/bbma-2014/6077688/michael-jackson-to-unleash-world-premiere-experience-at-billboard)
 25 [2014/6077688/michael-jackson-to-unleash-world-premiere-experience-at-billboard](http://www.billboard.com/articles/events/bbma-2014/6077688/michael-jackson-to-unleash-world-premiere-experience-at-billboard).

26 34. Several days later, beginning on or about May 15, media outlets began to report on "a
 27 rumor swirling that a Michael Jackson hologram will appear at the 2014 Billboard Music Awards"
 28 for a "performance" of a new, never-before released Jackson song called "Slave to the Rhythm."

1 See Carl Willott, Michael Jackson “Hologram” Rumored to Appear at 2014 Billboard Music
 2 Awards, Idolator (May 15, 2014), [http://www.idolator.com/7518371/michael-jackson-hologram-](http://www.idolator.com/7518371/michael-jackson-hologram-billboard-music-awards-rumor)
 3 [billboard-music-awards-rumor](http://www.idolator.com/7518371/michael-jackson-hologram-billboard-music-awards-rumor). Another report stated that “[a] hologram of Michael Jackson will
 4 reportedly dance across the stage at Sunday’s Billboard music awards. The digital rendering of the
 5 late pop star has been booked to perform one of his ‘new’ songs, Slave to the Rhythm.” See Sean
 6 Michaels, Will Michael Jackson’s Hologram Dance at the Billboard Music Awards?, The Guardian
 7 (May 15, 2014, 5:45 AM), [http://www.theguardian.com/music/2014/may/15/michael-jackson-](http://www.theguardian.com/music/2014/may/15/michael-jackson-hologram-billboard-music-awards-2014)
 8 [hologram-billboard-music-awards-2014](http://www.theguardian.com/music/2014/may/15/michael-jackson-hologram-billboard-music-awards-2014). On information and belief, Textor circulated the Michael
 9 Jackson “rumor” to generate publicity for himself and the other Defendants.

10 35. The highly anticipated Jackson hologram finally appeared half-way through the
 11 Billboard Music Awards on May 18. After an introduction by entertainers Ludacris, Brad Paisley
 12 and Kesha, the performance began with a synchronized SWAT Team dancing until a curtain rose to
 13 reveal the late King of Pop sitting on a throne. Surrounded by live dancers, Jackson’s hologram
 14 sang “Slave to the Rhythm,” lifted from his recent posthumous album “Xscape.” During the
 15 performance, the hologram walked, danced, twirled, crouched and moonwalked around the stage. It
 16 was the biggest moment at the awards show.

17 36. The Jackson performance catapulted the Billboard Music Awards into the top
 18 television spot of the night, and made it the most-watched edition of the awards program in 13 years.
 19 According to Nielson ratings, the program pulled in an average of 10.5 million viewers over the
 20 course of the three-hour show. See Phil Gallo, Billboard Music Awards Ratings Hit 13-Year High,
 21 Billboard (May 19, 2014, 12:32 PM), [http://www.billboard.com/articles/events/bbma-](http://www.billboard.com/articles/events/bbma-2014/6092128/tv-ratings-billboard-music-awards-abc)
 22 [2014/6092128/tv-ratings-billboard-music-awards-abc](http://www.billboard.com/articles/events/bbma-2014/6092128/tv-ratings-billboard-music-awards-abc). The show “reached the biggest audience
 23 between 9 and 9:30 p.m., when 11.5 million viewers tuned in. That half-hour saw the much-
 24 tweeted-about performance by a hologram of the late Michael Jackson.” Michael O’Connell, TV
 25 Ratings: Billboard Music Awards Hit 13-Year High, The Hollywood Reporter (May 19, 2014, 9:08
 26 AM), <http://www.hollywoodreporter.com/live-feed/tv-ratings-billboard-music-awards-705598>.

27 37. Indeed, the Jackson hologram was and continues to be a huge trending topic on social
 28 media. In the days following the performance, Jackson totaled over 80,000 Twitter followers, an

1 increase of over 700%. *See* Liv Buli, The Pop King (Still) Rises: Social Legacy of Michael Jackson,
 2 *Forbes* (May 20, 2014, 10:39 AM), [http://www.forbes.com/sites/livbuli/2014/05/20/the-pop-king-](http://www.forbes.com/sites/livbuli/2014/05/20/the-pop-king-still-rises-social-legacy-of-michael-jackson)
 3 [still-rises-social-legacy-of-michael-jackson](http://www.forbes.com/sites/livbuli/2014/05/20/the-pop-king-still-rises-social-legacy-of-michael-jackson). Due in large part to the hologram, the 2014 Billboard
 4 Music Awards show “topped the Nielsen Twitter TV Ratings (NTTR) Weekly Top Ten Series and
 5 Specials list with 5.5 million event-related Tweets that were seen by a Unique Audience of 10.2
 6 million people.” *See* Dina Gachman, 2014 Billboard Music Awards Tops Nielsen Twitter Ratings,
 7 *Forbes* (May 19, 2014, 3:35 PM), [http://www.forbes.com/sites/dinagachman/2014/05/19/2014-](http://www.forbes.com/sites/dinagachman/2014/05/19/2014-billboard-music-awards-tops-nielsen-twitter-ratings)
 8 [billboard-music-awards-tops-nielsen-twitter-ratings](http://www.forbes.com/sites/dinagachman/2014/05/19/2014-billboard-music-awards-tops-nielsen-twitter-ratings). As of May 27, 2014, the official performance
 9 of the Jackson performance at the 2014 Billboard Music Awards had reached 11.9 million views on
 10 Vevo.

11 38. News sources widely reported that many viewers were disappointed with the quality
 12 of the holographic-like performance. The *Los Angeles Times* wrote that “[t]he performance divided
 13 social media as fan reaction ranged from shock and awe to disappointment.” Gerrick D. Kennedy,
 14 Billboard Music Awards: Michael Jackson Thrills in Hologram, *Los Angeles Times* (May 19, 2014,
 15 4:00 AM), [http://www.latimes.com/entertainment/music/la-et-ms-billboard-music-awards-](http://www.latimes.com/entertainment/music/la-et-ms-billboard-music-awards-20140519-story.html)
 16 [20140519-story.html](http://www.latimes.com/entertainment/music/la-et-ms-billboard-music-awards-20140519-story.html). Another news source explained that “many of the viewers were not very
 17 pleased with the hologram-like technology used to bring back MJ to life. They felt that it was done
 18 badly and found that it did not resemble him but just looked like his mere impersonator. And also
 19 the moonwalk was termed as dry by many.” Priya Prakashan, Billboard Music Awards 2014: King
 20 of Pop Michael Jackson Returns to Stage – Watch Hologram Video!, *India.com* (May 19, 2014, 4:09
 21 PM), [http://www.india.com/showbiz/billboard-music-awards-2014-king-of-pop-michael-jackson-](http://www.india.com/showbiz/billboard-music-awards-2014-king-of-pop-michael-jackson-returns-to-stage-watch-hologram-video-60037)
 22 [returns-to-stage-watch-hologram-video-60037](http://www.india.com/showbiz/billboard-music-awards-2014-king-of-pop-michael-jackson-returns-to-stage-watch-hologram-video-60037). Likewise, a CNN article criticized the performance,
 23 stating that “[i]t was eerily interesting because the illusion was effective if you didn’t watch too
 24 closely or weren’t obsessively familiar with Jackson’s dancing, walking and appearance.” It wrote
 25 that “[t]he dance moves were not really Michael Jackson’s but apparently those of a stand-in
 26 performer who recreated his steps for a computer that then laid on an image intended to replicate
 27 Jackson. But where was the swagger -- like Charlie Chaplin -- that characterized Jackson’s cool
 28 walk?” Alan Duke, Billboard Music Awards: MJ ‘Hologram’ and Kendall’s Flub Get Buzz, *CNN*

(May 19, 2014, 11:49 AM), <http://www.cnn.com/2014/05/19/showbiz/billboard-music-awards>; *see also* Amy Phillips, Creepy Michael Jackson Hologram Performs at Billboard Music Awards, Pitchfork (May 18, 2014, 10:37 PM), <http://pitchfork.com/news/55246-creepy-michael-jackson-hologram-performs-at-billboard-music-awards> (stating that the hologram “performed many of MJ’s signature dance moves, albeit in a slightly awkward, jerky, off-beat way. It was weird.”).

C. Defendants’ Infringement and On-Going Wrongful Conduct

39. Even though Hologram USA is the exclusive licensee to the Patents in Suit in the United States (except with respect to adult entertainment), Defendants did not obtain a license from Hologram USA or any of the other Plaintiffs to use the patented technology. In fact, Hologram USA rejected a proposal made by Textor and Pulse for a joint marketing agreement over the technology in April and May 2014 – days before Textor and Pulse used that technology without authorization to create the Jackson hologram.

40. In the aftermath of Jackson’s performance at the Billboard Music Awards show, many of the Defendants in this case publicly claimed credit for the technology that created the Jackson hologram. According to one on-line article, “a *Billboard* spokesperson told *Mashable* that the Estate of Michael Jackson and Pulse Evolution created the experience, which took longer than a year and more than 100 people.” *See* Brian Anthony Hernandez, Stunning Michael Jackson Hologram Performs at Billboard Music Awards, *Mashable* (May 18, 2014), <http://mashable.com/2014/05/18/michael-jackson-hologram-billboard-music-awards>. The Jackson Estate also has publicly denied that Hologram USA or its majority owner, Mr. David, had anything to do with the Jackson hologram. *See* Behind the Scenes Video and Message About Billboard Illusion From MJ Estate, LMJ (May 23, 2014), <http://www.legandarymichaeljackson.nl/news/behind-the-scens-video-and-message-about-billboard-illusion-from-mj-estate>.

41. Shortly after the holographic performance, Textor and Pulse’s Chief Executive Officer, Frank Patterson, invited *USA Today* to its Bay Area studios in Northern California to “explain the details behind Jackson’s performance.” They apparently claimed in this interview that “Pulse had refined a 19th-century magician’s technique called Pepper’s ghost,” which Digital

Domain¹ had employed “to summon the ghost of slain rapper Tupac Shakur at the Coachella music festival in 2012.” See Marco della Cava, Meet the Conjurors of Michael Jackson’s Ghost, USA Today (May 23, 2014, 12:32 PM), <http://www.usatoday.com/story/life/music/2014/05/22/michael-jackson-billboard-music-awards-illusion/9437881>. The technology referred to in the article above that was used to summon the ghost of Tupac Shakur was undisputedly covered by certain claims of the Patents in Suit; in fact, Digital Domain employed the technology in that instance subject to a license it had obtained to use the technology. Pulse never obtained any license to the patented technology; nor does it hold any related patent rights. Plaintiffs hold all those rights.

42. After Plaintiffs moved for a temporary restraining order in these court proceedings to enjoin Defendants from infringing the Patents Suit in order to create the hologram-like Jackson at the Billboard Music Awards, Defendants argued to this Court that they would not use the patented technology to create the hologram-like Michael Jackson. That argument is belied by the actual evidence. Initially, Textor attempted to obtain rights to the Patents in Suit in the months and days leading up to the Billboard Awards because he knew those rights were required. Further, at the conclusion of the Billboard Music Awards show on May 18, pursuant to this Court’s order, Plaintiffs conducted an inspection of the technology employed by Defendants to create the hologram-like images. During that inspection, Rock described the technology used for creating the hologram-like Michael Jackson and acknowledged that the set-up was based on the Patents in Suit, admitting “that in a nutshell, is what the first patent [the ’519 patent] is about.”

43. Further, *USA Today* published an interactive diagram that it obtained from Pulse in an on-line article, which confirms that Textor and Pulse used the Plaintiffs’ patented technology. The diagram shows that – just as in the ’519 patent – high-powered projectors are used to project an image onto a rear-projection screen, the image reflects off of the transparent foil arranged on stage at an angle of about 45 degrees. The projection bounces off the transparent foil into the audience, creating the illusion of a life-like three-dimensional image positioned on stage behind the transparent

¹ Digital Domain was responsible for the production of the 2012 Shakur hologram. Although Textor was CEO in early 2012, he had no role in that production. He was fired from Digital Domain in 2012. In attempting to raise money for Pulse, Textor circulated an investor memorandum that falsely claimed a company called VFX had produced the hologram-like Tupac while Textor served as Chairman and CEO. A true and correct copy of that investor memorandum is attached as Exhibit D.

1 foil. A true and correct copy of the *USA Today* article published on May 23, 2014 is attached as
 2 Exhibit E, and represents one rendition made by Pulse of the accused apparatus.

3 44. On information and belief, Textor and Pulse worked with the Musion Defendants to
 4 produce the holographic-like projection of Michael Jackson. Shortly after the Billboard Music
 5 Awards, Musion 3D prominently announced on its website that:

6 So now we can say it that Musion 3D was proud to have partnered in
 7 the production process with Pulse Entertainment since January 2014.
 8 The filming and dance sequences were shot on collaboration with
 9 Musion 3D using a proprietary 8K video production. The Foil used
 10 Musion proprietary fireproof foil and was rigged by Musion 3D. The
 11 production has been in rehearsals for many weeks. Musion 3D is not
 12 in any way connected with the company Musion Das Hologram.

13 Musion 3D Home Page, <http://www.musion3d.co.uk> (last visited May 29, 2014). Musion 3D
 14 recently removed that statement from its website, but a copy of a printout from the Musion 3D
 15 website is attached as Exhibit F. Musion 3D has publicly acknowledged it uses the Plaintiffs'
 16 patented technology.

17 45. Further, even while arguing that they do not use the Plaintiffs' patented technology,
 18 Defendants have inconsistently argued in these court proceedings that they "licensed" the right to do
 19 so. But Plaintiffs have not licensed any such rights to Defendants, and Plaintiffs are the only parties
 20 from which Defendants may license rights related to the Patents in Suit.

21 46. On information and belief, Defendants have infringed and, unless enjoined, will
 22 continue to infringe the Patents in Suit. According to *USA Today*, Textor and Pulse are reportedly
 23 fielding calls and inquiries from promoters and the estates of deceased entertainers interested in
 24 tours that use the holographic technology. "Textor won't reveal who's been in touch, but notes that
 25 obvious candidates for a posthumous show include Elvis Presley, Frank Sinatra and Bob Marley."
 26 See Marco della Cava, Jackson Mirage Heralds Future of Posthumous Shows, *USA Today* (May 22,
 27 2014, 9:44 PM), <http://www.usatoday.com/story/life/music/2014/05/22/michael-jackson-mirage-heralds-future-of-posthumous-shows/9447595>.

28 47. By claiming credit for the technology behind the high-profile hologram-like Jackson
 images, Defendants have created significant confusion in the marketplace. That confusion has
 diluted the value of the Hologram USA brand by causing confusion among potential customers. In

fact, Hologram USA has been involved in its own discussions with the estates of several significant entertainers (including Elvis Presley and Bob Marley), but its efforts to reach a deal have been thwarted by the presence of the Defendants who falsely claim that they are able to provide access to the same patented technology as Hologram USA. In addition, the quality of the Michael Jackson hologram has been criticized in several popular media outlets and by many noted observers, causing damage to the reputation of Plaintiffs' brand and further loss of goodwill.

48. Hologram USA's efforts to reach business deals with potential customers has been, and will continue to be, damaged by Defendants' wrongful conduct. Hologram USA has placed Defendants on notice of their infringing activities, but Defendants refuse to stop using the Plaintiffs' patented technology.

49. Based on information and belief, Defendants are infringing on one or more of the claims of the Patents in Suit.

50. Defendants' infringement of the '519, '212, and '361 patents has caused and will continue to cause monetary and other damages to Plaintiffs.

D. Defendants' Wrongful Conduct After The Filing Of This Action

51. After the filing of this action, Defendants continued their pattern of tortious conduct.

52. Approximately one month after this action was filed, on or about June 17, 2014, Musion IP Limited ("Musion IP") – is a private company organized and existing under the laws of the United Kingdom and controlled by Defendant O'Connell – recorded a purported assignment of the '212 patent with the PTO. According to this recorded document, Defendant O'Connell, purporting to act on behalf of MSL, had purportedly assigned the '212 patent to Musion IP more than one year earlier on May 29, 2013. This purported assignment remained hidden from the public for 13 months and was not recorded with the PTO until well after this litigation was filed.

53. To the extent Defendant O'Connell actually executed the purported assignment on May 29, 2013, that assignment to Musion IP was void and, on information and belief, fraudulent and in breach of O'Connell's fiduciary duties. On information and belief, Defendant O'Connell's purported transfer of the '212 patent to another one of his companies was an attempt to conceal assets from creditors, prospective buyers and any administrators appointed to handle MSL's

1 administration proceedings. On information and belief, no collateral was exchanged for the May 29,
2 2013 assignment. On information and belief, Defendant O'Connell also lacked authority to assign
3 the '212 patent on May 29, 2013.

4 54. On July 3, 2013, Defendant O'Connell presented the court in the UK with a petition
5 for winding up MSL. As part of the wind-up procedures, the UK court appointed joint
6 administrators to conduct the business of MSL and otherwise proceed with winding up of the
7 company. In September 2013, the administrators accepted an offer from MDH to acquire MSL's
8 assets. The '212 patent was specifically identified in a schedule of transferred patents in the Asset
9 Sale Agreement, dated September 18, 2013. On September 25, 2013, overruling Defendant
10 O'Connell's objections, the London High Court of Justice, Chancery Division approved the joint
11 administrators' sale of MSL's assets to MDH, and the court's decision was affirmed on appeal. Under
12 this order, MSL completed the sale of its assets (including the '212 patent and the '361 patent) to
13 MDH without being subject to any security interest claimed by Defendant O'Connell.

14 55. During the wind-up procedures, Mr. O'Connell did not inform MSL of his purported
15 May 29, 2013 assignment of the '212 patent to Musion IP. The purported assignment was otherwise
16 unknown and undisclosed to MDH before MDH purchased MSL's assets in an administration sale.
17 MDH is a bona fide good faith purchaser of the '212 patent. After MDH purchased substantially all
18 of MSL's assets, MDH promptly recorded its assignment of the '212 patent with the PTO on or
19 about November 11, 2013.

20 56. The Defendants have also misrepresented their rights to practice the Plaintiffs'
21 patented technology to existing or prospective customers in the United States and abroad. On
22 information and belief, Defendants O'Connell, Textor, Rock, Pulse and the Musion Defendants
23 conspired to falsely tell customers, potential customers, referral sources and other members of the
24 public that they (i.e., the Defendants) own rights to the Patents in Suit and the Plaintiffs' other
25 patented technology in the United States.

26 57. For example, on or about September 29, 2014, on information and belief, Defendant
27 O'Connell sent a mass email to many of his contacts in which he falsely claimed that an arbitration
28 decision rendered in the London Court of International Arbitration ("LCIA") establishes that his

1 company, Musion Events, holds “exclusive worldwide rights” to the invention that is the subject
2 matter of the Patents in Suit. O’Connell also falsely represented that “[i]t was found by the
3 arbitrator that licenses granted to James Rock and I for onward assignment to MEL survived the
4 purported termination by Uwe - thus his termination was found to be unlawful.” He also falsely
5 represented that “it appears the arbitrator concurs with our view” that the invention that is the
6 subject of the ’212 patent is not owned by MSL or MDH and that “there was a wrongful transfer by
7 the administrators acting for [MSL] of [these] patents to MDH.” In truth, the arbitrator did not make
8 any such findings. In fact, the arbitrator only decided a “narrow question of contract interpretation”
9 relating to Musion Events’ rights in five foreign countries, and did not make any findings with
10 respect to Maass’ termination of the licenses.

11 58. Even though they do not possess any legal rights to the Patents in Suit, on
12 information and belief, Defendants O’Connell, Textor, Rock, Pulse and the Musion Defendants
13 continue to falsely claim those rights in communications with customers, potential customers,
14 referral sources, as well other third parties. For example, on October 16, 2014, Pulse Evolution
15 Corporation, Textor’s company, announced a partnership with Authentic Brands Group, LLC
16 (“ABG”) to develop and create “holographic performances” of Marilyn Monroe. In their press
17 release, Pulse Evolution Corporation and ABG described their partnership as including “holographic
18 performances in theatrical productions, live appearances, mobile apps, commercials and more.” The
19 press release referred to the hologram-like Marilyn Monroe as the latest “virtual performer” in a
20 catalogue that includes Michael Jackson at the 2014 Billboard Music Awards and Tupac Shakur at
21 the 2012 Coachella Valley Music and Arts Festival.

22 **FIRST CLAIM FOR RELIEF**

23 **By Maass and Hologram USA Against All Defendants**

24 **(Infringement of Patent No. 5,865,519)**

25 59. Plaintiffs incorporate by reference the preceding averments set forth in the preceding
26 paragraphs.

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60. The '519 patent was duly and lawfully issued on February 2, 1999, to Uwe Maass and is titled "Device For Displaying Moving Images In The Background Of A Stage." A true and correct copy of the '519 patent is attached as Exhibit A.

61. Maass is the owner of the '519 patent, and Hologram USA has licensed the exclusive right to exploit this patent in all markets in the U.S. and Canada with the exception of adult entertainment. Maass and Hologram USA have the right to bring this suit for injunctive relief and damages.

62. On information and belief, Defendants have been, are currently and, unless enjoined, will continue to directly infringe one or more claims of the '519 patent by making, using, offering to sell, and selling within the United States the patented invention. Defendants' products and services embody and/or practice one or more claims of the '519 patent literally and/or under the doctrine of equivalents.

63. Defendants' infringing activities have caused and will continue to cause Plaintiffs irreparable harm, for which it has no adequate remedy at law, unless Defendants' infringing activities are enjoined by this Court in accordance with 35 U.S.C. § 283.

64. Plaintiffs have been and continue to be damaged by Defendants' infringement of the '519 patent in an amount to be determined at trial.

SECOND CLAIM FOR RELIEF

By MDH and Hologram USA Against All Defendants

(Infringement of Patent No. 7,883,212)

65. Plaintiffs incorporate by reference the preceding averments set forth in the preceding paragraphs.

66. The '212 patent was duly and lawfully issued on February 8, 2011 and is titled "Projection Apparatus And Method For Pepper's Ghost Illusion." Ian O'Connell and James Rock are the named inventors. A true and correct copy of the '212 patent is attached as Exhibit B.

67. In or about September 2006, Ian O'Connell and James Rock assigned all their interests in the anticipated application for the '212 patent to MSL. A true and correct copy of the assignment, as recorded with the PTO, is attached as Exhibit G.

68. In or about September 2013, MSL assigned all its interests in the '212 patent to MDH. A true and correct copy of the assignment, as recorded with the PTO, is attached as Exhibit G.

69. MDH is the owner of the '212 patent, and Hologram USA has licensed the exclusive right to exploit this patent in all markets in the U.S. and Canada with the exception of adult entertainment. MDH and Hologram USA have the right to bring this suit for injunctive relief and damages.

70. On information and belief, Defendants have been, are currently and, unless enjoined, will continue to directly infringe one or more claims of the '212 patent by making, using, offering to sell, and selling within the United States the patented invention. Defendants' products and services embody and/or practice one or more claims of the '212 patent literally and/or under the doctrine of equivalents.

71. Defendants' infringing activities have caused and will continue to cause Plaintiffs irreparable harm, for which it has no adequate remedy at law, unless Defendants' infringing activities are enjoined by this Court in accordance with 35 U.S.C. § 283.

72. Plaintiffs have been and continue to be damaged by Defendants' infringement of the '212 patent in an amount to be determined at trial.

THIRD CLAIM FOR RELIEF

By MDH and Hologram USA Against All Defendants

(Infringement of Patent No. 8,328,361)

73. Plaintiffs incorporate by reference the preceding averments set forth in the preceding paragraphs.

74. The '361 patent was duly and lawfully issued on December 11, 2012 and is titled "Projection Apparatus and Method for Pepper's Ghost Illusion." Ian O'Connell and James Rock are the named inventors. A true and correct copy of the '361 patent is attached as Exhibit C.

75. The '361 patent is a continuation of the '212 patent. In or about September 2006, Rock and O'Connell assigned to '212 patent, including any continuations such as the '361 patent, to MSL.

76. In or about September 2013, MSL assigned all its interests in the '361 patent to MDH pursuant to the administration sale.

77. MDH is the owner of the '361 patent, and Hologram USA is the exclusive licensee to the '361 patent in all markets in the U.S. and Canada with the exception of adult entertainment. MDH and Hologram USA have the right to bring this suit for injunctive relief and damages.

78. On information and belief, Defendants have been, are currently and, unless enjoined, will continue to directly infringe one or more claims of the '361 patent by making, using, offering to sell, and selling within the United States the patented invention. Defendants' products and services embody and/or practice one or more claims of the '361 patent literally and/or under the doctrine of equivalents.

79. Defendants' infringing activities have caused and will continue to cause Plaintiffs irreparable harm, for which it has no adequate remedy at law, unless Defendants' infringing activities are enjoined by this Court in accordance with 35 U.S.C. § 283.

80. Plaintiffs have been and continue to be damaged by Defendants' infringement of the '361 patent in an amount to be determined at trial.

FOURTH CLAIM FOR RELIEF

By Maass and Hologram USA Against All Defendants For the '519 Patent

By MDH and Hologram USA Against All Defendants For the '212 and '361 Patents

(Willful Infringement)

81. Plaintiffs incorporate by reference the preceding averments set forth in the preceding paragraphs.

82. As alleged above, the Defendants are and have been aware of the Patents in Suit. The Defendants have been practicing and continue to practice the technology claimed in the Patents in Suit without a valid license to do so. Defendants' infringement of the Patents in Suit has been willful.

83. The Defendants knew about the Patents in Suit before the complaint in this action was filed, and acted despite an objectively high likelihood that its actions constituted infringement of a valid patent. Rock and O'Connell are named as inventors on the '212 patent and the '361 patent,

1 and they had prior knowledge of the '519 patent from their prior business dealings, including the
2 Tupac hologram at Coachella and many other holographic-like projects featured on their website.
3 See Our Projects, Musion, <http://musion.co.uk/projects> (last visited May 29, 2014). Rock and
4 O'Connell (together with Musion) have falsely claimed that the Musion Defendants own certain
5 rights to the Patents in Suit. Thus, the Musion Defendants, Rock and O'Connell unquestionably
6 knew about the Patents in Suit before this lawsuit was filed.

7 84. Moreover, several of the Defendants are known to be repeat users of the Patents in
8 Suit. In particular, Textor (and by extension, his Pulse companies) was well aware of the Patents in
9 Suit from his prior experience as the CEO of Digital Domain when it licensed the rights to use the
10 technology to create a hologram of Tupac Shakur for the 2012 Coachella Music Festival. After the
11 YouTube video of the Tupac hologram went viral, the Plaintiffs' patented technology grew in
12 popularity within the entertainment industry. Shortly thereafter, based on information and belief, the
13 Jackson Estate, working in partnership with Cirque du Soleil, used the technology to create a
14 hologram-like Michael Jackson in a show on the Las Vegas strip entitled "Michael Jackson: One,"
15 which began previews in or about May 2013. Accordingly, the various Defendants in this case have
16 had extensive prior experience with the Patents in Suit and Plaintiffs' other patented technology.

17 85. Under the circumstances, the Defendants surely understood that the technology used
18 to create the hologram-like images was patented. According to news reports, it took months to
19 create the hologram-like Jackson for the Billboard Music Awards, which was planned to be the
20 surprise highlight of the nationally televised awards show. All of the Defendants are sophisticated
21 and experienced players in the entertainment industry with reason to know about the existence of the
22 Patents in Suit. In fact, Plaintiffs have previously filed lawsuits against companies for infringement
23 of the Patents in Suit. Most significantly, in March 2014, Plaintiffs filed suit against the Jackson
24 Estates' partner, Cirque du Soleil, regarding their unauthorized use of certain of the Patents in Suit to
25 create a hologram-like Michael Jackson for the Cirque show entitled "Michael Jackson: One."
26 Notwithstanding this prior lawsuit, the Jackson Estate and the other Defendants in this case
27 deliberately and willfully infringed the Patents in Suit again, in order to create an even more high-
28 profile holographic-like performance by Michael Jackson to air on national television during the

1 Billboard Music Awards on May 18, 2014.

2 86. Despite their knowledge of the existence of the Patents in Suit, based on information
3 and belief, Defendants willfully, intentionally and consciously infringed the Patents in Suit in
4 disregard of Plaintiffs' rights.

5 87. Immediately after Plaintiffs learned of Defendants' plans to infringe the Patents in
6 Suit in order to create a holographic-like performance of Michael Jackson for the Billboard Music
7 Awards, Plaintiffs placed Defendants on written notice of their alleged infringement. Plaintiffs
8 demanded in their pre-litigation letter that Defendants (including Dick Clark Productions, the
9 Jackson Estate, Textor and Pulse) agree to refrain from displaying the infringing hologram-like
10 Michael Jackson during the May 18 award show. Defendants refused this demand, and Plaintiffs
11 subsequently filed suit. A true and correct copy of this May 15, 2014 demand letter is attached as
12 Exhibit H.

13 88. As a direct and proximate result of Defendants' willful infringement of the Patents in
14 Suit, Plaintiffs have been and will continue to suffer monetary damages and irreparable injury.
15 Defendants have created on-going confusion in the marketplace as to the rightful owners and
16 licensors of the Patents in Suit, which renders this case appropriate for treble damages.

17 **FIFTH CLAIM FOR RELIEF**

18 **By Maass and Hologram USA Against All Defendants For the '519 Patent**

19 **By MDH and Hologram USA Against All Defendants For the '212 and '361 Patents**

20 **(Active Inducement)**

21 89. Plaintiffs incorporate by reference the preceding averments set forth in the preceding
22 paragraphs.

23 90. In addition to or as an alternative to directly infringing the Patents in Suit, the
24 Defendants are liable for indirect infringement. The Defendants actively induced the direct
25 infringement of the Patents in Suit in violation of 35 U.S.C. section 271(b), which provides that
26 "[w]hoever actively induces infringement of a patent shall be liable as an infringer." The
27 Defendants have continued to do so after the initial Complaint was filed in this case.
28

1 91. As alleged in greater detail above, the Defendants knew about the Patents in Suit
2 before the complaint in this action was filed, and acted with knowledge that their induced acts
3 constitute patent infringement. Defendants are familiar with the Patents in Suit and have had prior
4 experiences with the Plaintiffs' patented technology – which is widely known within the
5 entertainment industry. Further, Plaintiffs expressly demanded that Defendants refrain from
6 misappropriating their patented technology to create an unauthorized holographic-like performance
7 of Michael Jackson at the Billboard Music Awards before this lawsuit was filed.

8 92. The Defendants engaged in multiple instances of infringement, including directly
9 and/or indirectly. While some information is publicly available, much of the information about the
10 role of each of the Defendants in directly and indirectly infringing the Patents in Suit is within the
11 possession, custody and control of the Defendants.

12 93. On information and belief, the Defendants intended to induce infringement of the
13 Patents in Suit. The Defendants worked together in secret to create a holographic-like performance
14 of Michael Jackson, which was unveiled to the public on live television at the 2014 Billboard Music
15 Awards. All the Defendants – including the Jackson Estate, MJJ Productions and Dick Clark
16 Productions – intended to induce each other to infringe the Patents in Suit, so that the awards show
17 and Jackson's newly released album would benefit from a spectacular "live" performance by
18 Michael Jackson as "you've never seen him before." See Michael Jackson to Unleash World
19 Premiere Experience at Billboard Music Awards, Billboard (May 8, 2014, 6:00 AM),
20 [http://www.billboard.com/articles/events/bbma-2014/6077688/michael-jackson-to-unleash-world-](http://www.billboard.com/articles/events/bbma-2014/6077688/michael-jackson-to-unleash-world-premiere-experience-at-billboard)
21 [premiere-experience-at-billboard](http://www.billboard.com/articles/events/bbma-2014/6077688/michael-jackson-to-unleash-world-premiere-experience-at-billboard). Indeed, each of the Defendants caused, urged, encouraged and/or
22 aided in the infringing conduct.

23 94. In particular, based on information and belief, the Musion Defendants, Rock and
24 O'Connell intended to induce infringement of the Patents in Suit. The Musion Defendants, Rock
25 and O'Connell falsely claimed that they possessed legal valid rights to the Patents in Suit. Further,
26 they intentionally induced infringement of the Patents in Suit by having customers sell, offer to sell,
27 use and import into the United States and this Judicial District, and placing into the stream of
28 commerce, the claimed invention (e.g., "Eyeliner certified flame retardant Foil") with knowledge

1 that such products infringe the Patent At Issue. Musion 3D provides, among others things, “services
2 including initial design consultation and advice, CAD drawings, equipment technical riders, Foil
3 delivery and installation from one of our tech support crew”, and it advertises that “technical staff
4 are on-hand to guide you, and your preferred production company, through your requirements to
5 ensure the absolute success of your Eyeliner experience.” See Fire Retardent [sic] Foil, Musion 3D,
6 <http://www.musion3d.co.uk/products/fire-retardant-foil> (last visited May 29, 2014). Indeed, Musion
7 3D actively promotes “digital resurrection” on its website and encourages companies to use its
8 services “to create life-like holographic projections of celebrities, politicians, dignitaries, and other
9 significant figures.” See Digital Resurrection, Musion 3D,
10 <http://www.musion3d.co.uk/services/digital-resurrection> (last visited May 29, 2014). It also
11 advertises and promotes design and installation services on its website that infringe the Patents in
12 Suit. See Design and Installation, Musion 3D, [http://www.musion3d.co.uk/products/design-and-](http://www.musion3d.co.uk/products/design-and-installation)
13 [installation](http://www.musion3d.co.uk/products/design-and-installation) (last visited May 29, 2014). Further, Rock was present at the Billboard Music Awards
14 and was personally involved in the inspection and disassembly of the apparatus used to create the
15 Jackson hologram after the show.

16 95. Likewise, Textor and Pulse intended to induce infringement of the Patents in Suit.
17 Textor and Pulse worked with the Musion Defendants, Rock and O’Connell to provide and operate
18 the patented technology that was used to create the hologram-like Jackson. Indeed, Textor and Pulse
19 actively promote their expertise in developing “‘virtual humans’ for live and holographic concerts,
20 advertising, feature films, branded content, medical applications and training.” See About, Pulse,
21 <http://www.pulse.co/about-pulse> (last visited May 29, 2014). As with Rock, Textor was personally
22 present at the Billboard Music Awards show when the hologram-like Jackson was aired to a national
23 audience.

24 96. As a direct and proximate result of Defendants’ induced infringement of the Patents
25 in Suit, Plaintiffs have been and will continue to suffer monetary damages and irreparable injury.
26
27
28

SIXTH CLAIM FOR RELIEF**By Maass and Hologram USA Against All Defendants For the '519 Patent****By MDH and Hologram USA Against All Defendants For the '212 and '361 Patents****(Contributory Infringement)**

97. Plaintiffs incorporate by reference the preceding averments set forth in the preceding paragraphs.

98. In addition to or as an alternative to directly infringing the Patents in Suit, the Defendants are liable for indirect infringement. The Defendants engaged in contributory infringement of the Patents in Suit in violation of 35 U.S.C. section 271(c), which provides that “[w]hoever offers to sell or sells within the United States or imports into the United States a component of a patented machine, manufacture, combination or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in an infringement of such patent, and not a staple article or commodity of commerce suitable for substantial noninfringing use, shall be liable as a contributory infringer.” The Defendants have continued to do so after the initial Complaint was filed in this case.

99. As alleged in greater detail above, the Defendants knew about the Patents in Suit before the complaint in this action was filed. Defendants are familiar with the Patents in Suit and have had prior experiences with the Plaintiffs’ patented technology – which is widely known within the entertainment industry. Further, Plaintiffs expressly demanded that Defendants refrain from misappropriating their patented technology to create an unauthorized holographic-like performance of Michael Jackson at the Billboard Music Awards before this lawsuit was filed.

100. Based on information and belief, Defendants contributed to the infringement of the Patents in Suit by having customers and/or collaborators sell, offer to sell, use and import into the United States and this Judicial District, and placing into the stream of commerce, the claimed invention including but not limited to “Eyeliner certified flame retardant Foil” and equipment rentals such as the “Musion 3D Eyeliner structures,” with knowledge that such products infringe the Patent At Issue. See Musion EyeLiner Foil – The Biggest 3D Holograms, Musion 3D,

1 <http://www.musion3d.co.uk/products/eyeliner> (last visited May 29, 2014); Fire Retardent [sic] Foil,
 2 Musion 3D, <http://www.musion3d.co.uk/products/fire-retardant-foil> (last visited May 29, 2014).

3 101. In particular, based on information and belief, Textor and Pulse worked with the
 4 Musion Defendants, Rock and O'Connell to provide and operate the patented technology that was
 5 used to create the hologram-like Jackson for the Billboard Music Awards. Additionally, discovery
 6 is likely to show that the Jackson Estate and MJJ Productions contributed to the infringement by
 7 selling, offering to sell or otherwise providing materials from its Cirque show in Las Vegas to assist
 8 in practicing the patented invention.

9 102. Based on information and belief, Defendants' products, including but not limited to
 10 the Eyeliner certified flame retardant Foil, are especially made or adapted for infringing the Patents
 11 in Suit and have no substantially non-infringing uses. Indeed, this Foil was specially designed for
 12 the purpose of practicing the Patents in Suit.

13 103. As a direct and proximate result of Defendants' contributory infringement of the
 14 Patents in Suit, Plaintiffs have been and will continue to suffer monetary damages and irreparable
 15 injury.

16 **SEVENTH CLAIM FOR RELIEF**

17 **By Maass and Hologram USA Against All Defendants For the '519 Patent**

18 **By MDH and Hologram USA Against All Defendants For the '212 and '361 Patents**

19 **(Preliminary and Permanent Injunction)**

20 104. Plaintiffs incorporate by reference the preceding averments set forth in the preceding
 21 paragraphs.

22 105. Immediate and irreparable injury will result to Plaintiffs unless this Court enters a
 23 Preliminary Injunction, pursuant to FRCP 65, enjoining all Defendants and their agents, servants,
 24 employees, attorneys, subsidiaries and any other individual or entity in active concert or
 25 participation with them who receives actual notice of the order, from infringing, inducing others to
 26 infringe, or contributing to the infringement of the Patents in Suit, including the manufacture, use,
 27 sale, importation, and offer to sell any holographic-like equipment or services related to the use of
 28 such holographic-like equipment covered by the Patents in Suit.

1 106. Plaintiffs have a likelihood of success on the merits given that there is no dispute that
2 Defendants have infringed and continue to infringe the Patents in Suit, by using and selling this
3 patented technology to create a holographic-like image of Michael Jackson which “performed” a
4 never-before released song of Michael Jackson’s at the 2014 Billboard Music Awards. Defendant
5 Textor’s attempts to acquire rights to the Patents in Suit in the days leading up to the Billboard
6 Music Awards belie any self-serving attempt to now claim another technology was employed to
7 create that performance.

8 107. As a result of Defendants’ unlawful activities, Plaintiffs have suffered and will suffer
9 irreparable harm. Hologram USA has spent several million dollars building the Hologram USA
10 name and brand. For instance, Hologram USA spent millions of dollars to build a Beverly Hills
11 showroom to display and market the Plaintiffs’ patented technology to potential customers.

12 108. The acts of the Defendants have already caused Plaintiffs significant harm. By
13 advertising, promoting and displaying a Michael Jackson holographic image at the 2014 Billboard
14 Music Awards, Defendants have created significant confusion in the marketplace. That confusion
15 has diluted the value of the Hologram USA brand by causing confusion among potential customers.
16 The actions of the Defendants have interfered with numerous potential business deals between
17 Hologram USA and potential customers. On information and belief, Defendants are continuing to
18 promote and sell the infringing products and services to other prospective customers and also intend
19 to employ the hologram-like Michael Jackson in several other planned live performances in the
20 coming weeks and months.

21 109. If Defendants are permitted to continue their infringing conduct, including but not
22 limited to the continued promotion of their services following the display of the Michael Jackson
23 holographic-like image at the 2014 Billboard Music Awards, the irreparable harm suffered by
24 Hologram USA will be immeasurable. The publicity associated with such a display cannot be
25 reduced to monetary terms.

26 110. Defendants’ actions will continue to irreparably harm Plaintiffs’ business reputation
27 and brand by creating consumer confusion as to the true owner of the patented technology. No
28 adequate remedy at law will alleviate this harm.

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EIGHTH CLAIM FOR RELIEF

By Hologram USA Against Textor, Pulse, the Musion Defendants, O'Connell and Rock

(Intentional Interference with Prospective Economic Advantage)

111. Plaintiffs incorporate by reference the preceding averments set forth in the preceding paragraphs.

112. A prospective contractual relationship existed between Plaintiffs and their prospective customers in the United States and Canada.

113. As a result of their prior business and legal dealings with Plaintiffs, Textor, O'Connell, Rock and their respective companies knew of the prospective contractual relationship between Plaintiffs and their prospective customers in the United States and Canada.

114. Textor, O'Connell, Rock and their respective companies committed intentional acts intended or designed to disrupt and/or prevent the relationships between Plaintiffs and their prospective customers. Among other things, they conspired to falsely represent that they had the legal rights to practice the Patents in Suit and other Plaintiff's technology in the United States, recorded a fraudulent assignment of the '212 patent with the U.S. Patent and Trademark Office, and misrepresented the findings of the arbitrator in the LCIA arbitration.

115. Textor, O'Connell, Rock and their respective companies had no privilege or justification for their actions.

116. As a direct and proximate result of the actions and conduct of Textor, O'Connell, Rock and their respective companies, Plaintiffs have been damaged in an amount to be determined at trial.

NINTH CLAIM FOR RELIEF

By Maass and MDH Against O'Connell

(Breach of Fiduciary Duty/Corporate Usurpation)

117. Plaintiffs incorporate by reference the preceding averments set forth in the preceding paragraphs.

118. As a former director of MSL, O'Connell owed certain fiduciary duties to the company, its creditors and its shareholders. O'Connell owed fiduciary duties to Maass because

Maass was a shareholder and a creditor of MSL.

119. O'Connell breached his fiduciary duties. Among other things, on his last day as a director of MSL before he was removed from office, he engaged in self-dealing and otherwise breached his fiduciary duties by purporting to assign the '212 patent and certain other intellectual property rights owned by MSL to Musion IP.

120. As a direct and proximate cause of O'Connell's breach of said duty, Maass and MDH sustained damages in an amount to be determined at trial.

121. In addition to Maass, MDH has standing to sue O'Connell for his wrongful assignment of the '212 patent and certain other intellectual property rights to Musion IP. At the time of this breach, O'Connell knew that MSL was insolvent and understood that MSL's assets likely would be auctioned off in an administration sale during bankruptcy proceedings. In fact, O'Connell presented a petition for the winding up of MSL on July 3, 2013 – only days after he made the fraudulent assignment to Musion IP and was removed as a director.

122. As a result of the sale of substantially all of MSL's assets, MDH acquired various rights and causes of action previously owned by MSL. Among other things, MSL assigned to MDH "all rights of action (whether already accrued or arising in the future) relating to any of the Goodwill or Business Intellectual Property Rights", which includes claims arising out of the '212 patent and other intellectual property rights previously owned by MSL. Accordingly, MDH has standing to sue O'Connell for his wrongful conduct in connection with the fraudulent assignment.

123. By virtue of the foregoing conduct, O'Connell acted despicably and with recklessness, oppression, and malice, and punitive damages should be assessed for that reason.

TENTH CLAIM FOR RELIEF

By All Plaintiffs Against Textor, Pulse, the Musion Defendants, O'Connell and Rock

(False Advertising)

124. Plaintiffs incorporate by reference the preceding averments set forth in the preceding paragraphs.

125. As set forth above, Textor, O'Connell, Rock and their respective companies have made public communications and announcements that contain false and misleading statements of

1 fact regarding their own products and Plaintiffs' products. These public communications and
2 announcements contain actual misstatements and/or misleading statements or failures to disclose. In
3 particular, they have published false statements to existing or potential customers asserting that they
4 possess the legal rights to practice the Patents in Suit and that the arbitrator in the LCIA Arbitration
5 made specific findings that affirmed these rights.

6 126. These statements actually deceive, or have a tendency to deceive, a substantial
7 segment of the intended audience, including potential purchasers and licensees of Plaintiffs'
8 products and services and other potential customers of Plaintiffs.

9 127. The misrepresentations and omissions made by Textor, O'Connell, Rock and their
10 respective companies are material and are likely to influence purchasing decisions in the relevant
11 markets. Such misrepresentations have proximately caused and/or are likely to cause injury to
12 Plaintiffs by diverting sales and licensing opportunities from Plaintiffs to the aforementioned
13 Defendants. Such conduct has also irreparably harmed Plaintiffs by leading consumers and others
14 in the trade to believe that Plaintiffs are not the rightful owners of the Patents in Suit or otherwise
15 lack exclusive technology rights for creating hologram-like images. Their conduct has substantially
16 injured the goodwill and business reputation of Plaintiffs in the marketplace, and as a result Plaintiffs
17 have lost market share and suffered lost revenue and financial harm.

18 128. The parties' respective products, technology and services about which Textor,
19 O'Connell, Rock and their respective companies have made misrepresentations, are marketed and
20 sold in interstate commerce, and in commerce between the United States and foreign countries, and
21 the misrepresentations and omissions were communicated across state borders and in interstate
22 commerce.

23 129. The publication of the misrepresentations and omissions and the other acts and
24 conduct of Textor, O'Connell, Rock and their respective companies, as alleged above, constitutes
25 false and deceptive trade practices in violation of Section 43(a) of the Lanham Act, 15 U.S.C.
26 § 1125(a), which caused harm and damage to Plaintiffs' business and products.

27 130. As a direct and proximate result of such conduct, Plaintiffs have and continue to
28 suffer damages in the form of lost profits, revenues and injury to its business in an amount to be

determined at trial.

131. Plaintiffs are entitled to recover the aforementioned Defendants' profits from their conduct in violation of the Lanham Act, an award of damages, including an amount up to three times the amount found as actual damages, and attorney's fees and costs under 15 U.S.C. C. § 1117(a).

132. Moreover, Plaintiffs will continue to suffer damages unless Textor, O'Connell, Rock, Pulse and the Musion Defendants, their officers, agents, servants, employees, attorneys, and those persons acting in concert with them are permanently enjoined from continuing such actions and appropriate corrective advertising is awarded.

ELEVENTH CLAIM FOR RELIEF

By All Plaintiffs Against Textor, Pulse, the Musion Defendants, O'Connell and Rock

(Unfair Competition)

133. Plaintiffs incorporate by reference the preceding averments set forth in the preceding paragraphs.

134. The wrongful and illegal conduct committed by Textor, O'Connell, Rock and their respective companies, as alleged above, constitutes unfair competition in violation of the common law of Nevada and other states where those Defendants are conducting their activities. In particular, Textor, O'Connell, Rock, and their respective companies misappropriated Plaintiffs' intellectual property rights and deceived actual or potential customers into believing that they own the rights to the Patents in Suit.

135. The aforementioned unfair competition has caused Plaintiffs to suffer significant harm, including monetary damages, the precise amount of which is to be proven at trial.

136. The actions of Textor, O'Connell, Rock and their respective companies, as described above, were malicious, deliberate, intentional, and embarked upon with the knowledge of, or conscious disregard of, the harm that would be inflicted upon Plaintiffs. As a result of said intentional conduct, Plaintiffs are entitled to punitive damages in an amount sufficient to punish those Defendants and to deter others from like conduct.

REQUEST FOR RELIEF

WHEREFORE, Plaintiffs respectfully request that:

- a. Judgment be entered that Defendants have infringed one or more claims of the '212, '361 and '519 patents;
- b. Judgment be entered permanently enjoining Defendants, their directors, officers, agents, servants, and employees, and those acting in privity or in concert with them, and their subsidiaries, divisions, successors and assigns, from further acts of infringement of the '212, the '361 and '519 patents;
- c. Judgment be entered that Defendants' infringement has been willful;
- d. Judgment be entered awarding Plaintiffs all damages adequate to compensate them for Defendants' infringement of the '212, the '361 and '519 patents, including all pre-judgment and post-judgment interest at the maximum rate permitted by law, and including a trebling of such damages due to Defendants' willful infringement;
- e. Judgment be entered ordering Textor, O'Connell, Rock, Pulse and the Musion Defendants to pay special, general, treble and punitive damages to Plaintiffs according to proof at trial for their unfair competition and false advertising;
- f. Judgment be entered requiring Textor, O'Connell, Rock, Pulse and the Musion Defendants to account for the profits from their unfair competition, and disgorge any such profits to Plaintiffs;
- g. Judgment be entered declaring that O'Connell's purported assignments allegedly made on behalf of MSL of the '212 patent, the '361 patent, and certain other intellectual property rights to Musion IP are fraudulent, unlawful and void, and that MDH is the legal owner of those rights;
- h. Judgment be entered that this case is exceptional under 35 U.S.C. § 285, with an award to Plaintiffs of their attorneys' fees incurred in bringing and litigating this action;
- i. Judgment be entered for an award to Plaintiffs of their costs of suit herein; and
- j. Judgment be entered awarding all other relief as the Court deems proper.

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DEMAND FOR JURY TRIAL

Please take notice that Plaintiffs demand trial by jury in this action.

DATED this 30th day of January, 2015.

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Hologram Limited and Uwe Maass*

EXHIBIT A



US005865519A

United States Patent [19]

Maass

[11] Patent Number: **5,865,519**
 [45] Date of Patent: **Feb. 2, 1999**

[54] **DEVICE FOR DISPLAYING MOVING IMAGES IN THE BACKGROUND OF A STAGE**

5,573,325 11/1996 Lekowski 353/28
 5,669,685 9/1997 Kotai et al. 353/28
 5,685,625 11/1997 Beaver 353/28

[76] Inventor: **Uwe Maass**, Lindlarer Strasse 107,
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[21] Appl. No.: **836,911**

[22] PCT Filed: **Aug. 31, 1996**

[86] PCT No.: **PCT/EP96/03832**

§ 371 Date: **Jul. 7, 1997**

§ 102(e) Date: **Jul. 7, 1997**

[87] PCT Pub. No.: **WO97/11405**

PCT Pub. Date: **Mar. 27, 1997**

[30] Foreign Application Priority Data

Sep. 20, 1995 [DE] Germany 295 15 073 U

[51] Int. Cl.⁶ **G03B 21/28**

[52] U.S. Cl. **353/28; 359/630; 472/58**

[58] Field of Search **353/28, 98, 30,**
353/29, 10; 359/478, 630; 472/58, 61, 63

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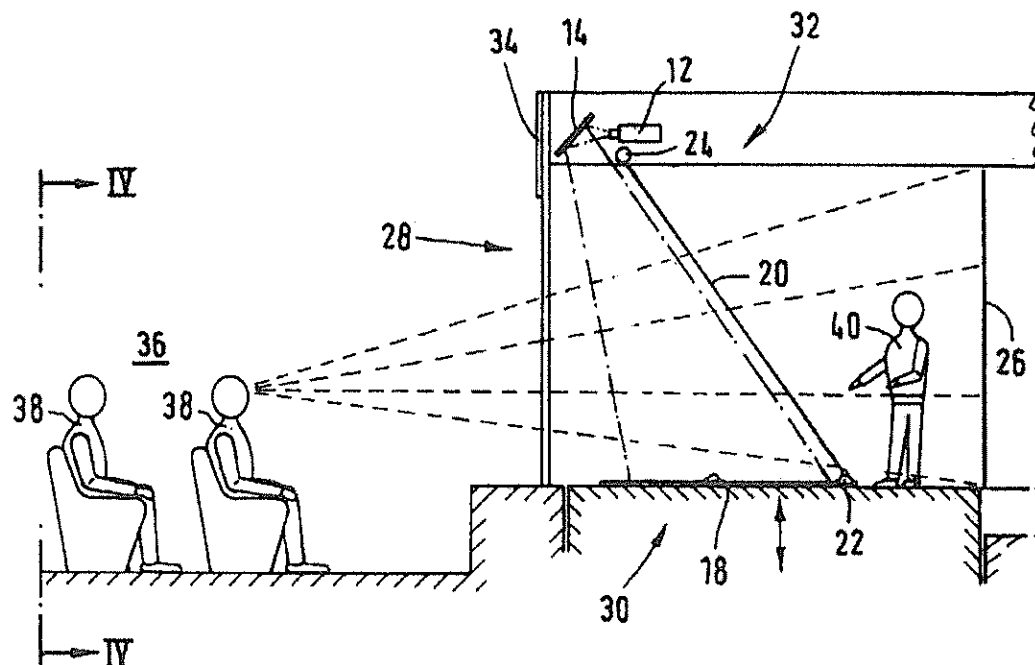
Primary Examiner—William Dowling

Attorney, Agent, or Firm—Klauber & Jackson

[57] ABSTRACT

An article such as for example a motor vehicle at a publicity function is to be represented in front of different viewers (38) in the background of a stage (28) in the form of a virtual image (26). A presenter (40) is to stand in the image and give explanations. Disposed above the stage (28) is an image source (12, 14). It projects an image, a film, on to a reflecting surface (18) on the floor (30) of the stage (28). Behind that reflecting surface (18) a transparent smooth foil (20) extends at 45° from the ceiling (32) to the floor (30). The image produced by the image source (12, 14) appears to the viewers (38) as a virtual image (26) behind the foil (20). The presenter (40) stands behind the foil (20) and in the middle of the image.

15 Claims, 5 Drawing Sheets



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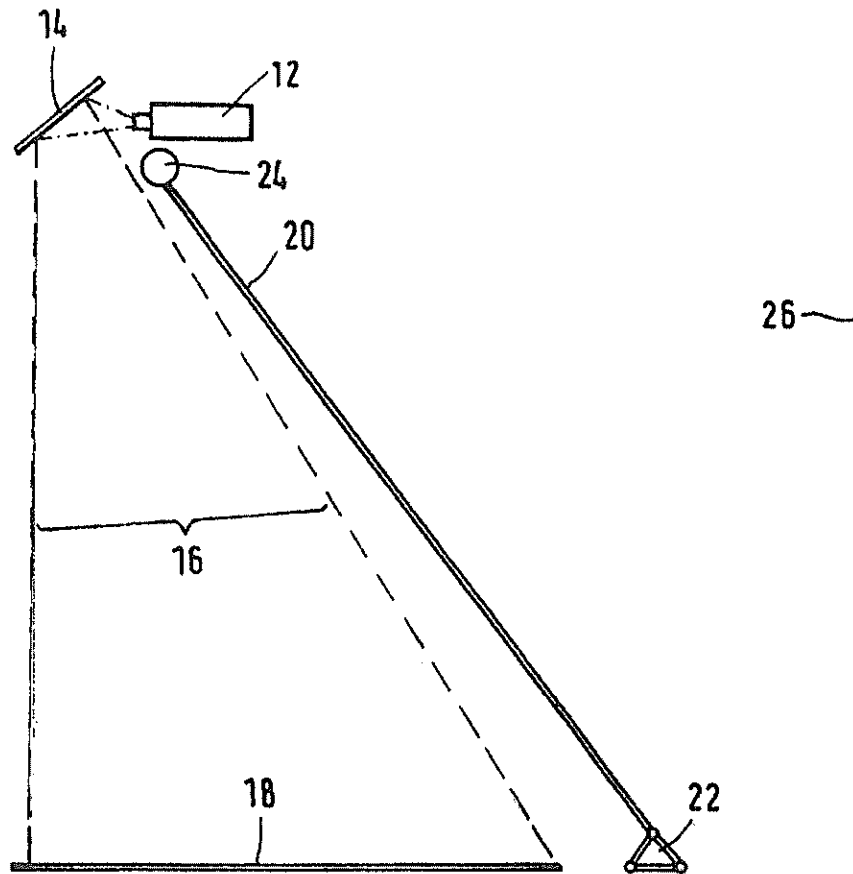


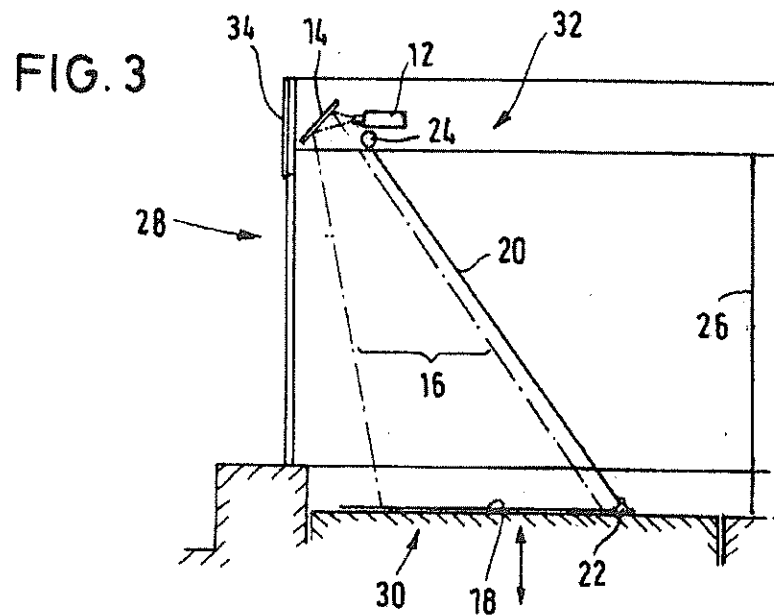
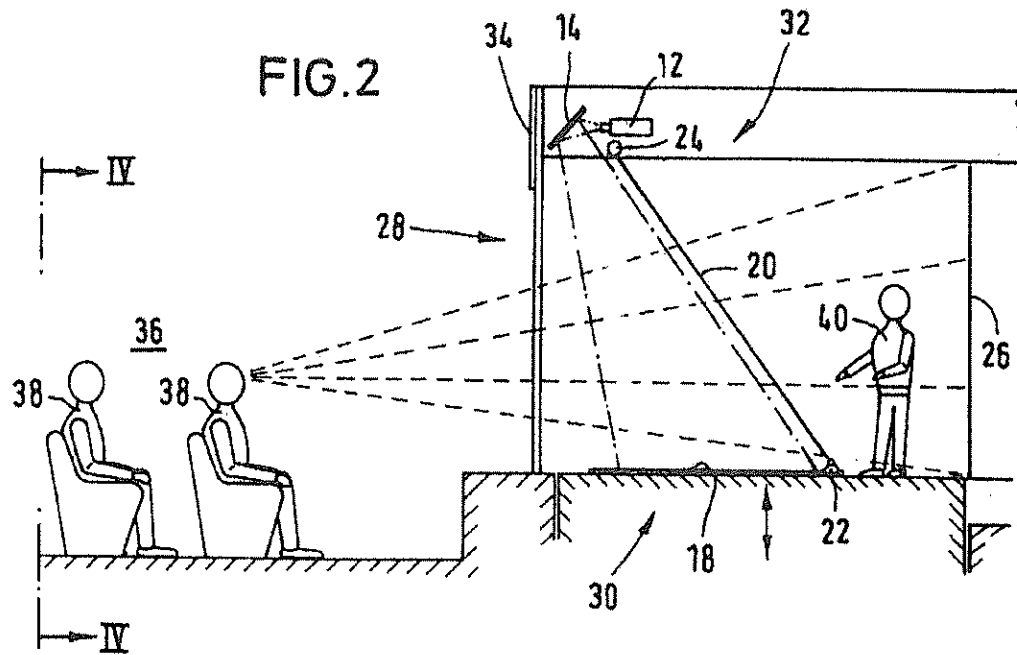
FIG.1

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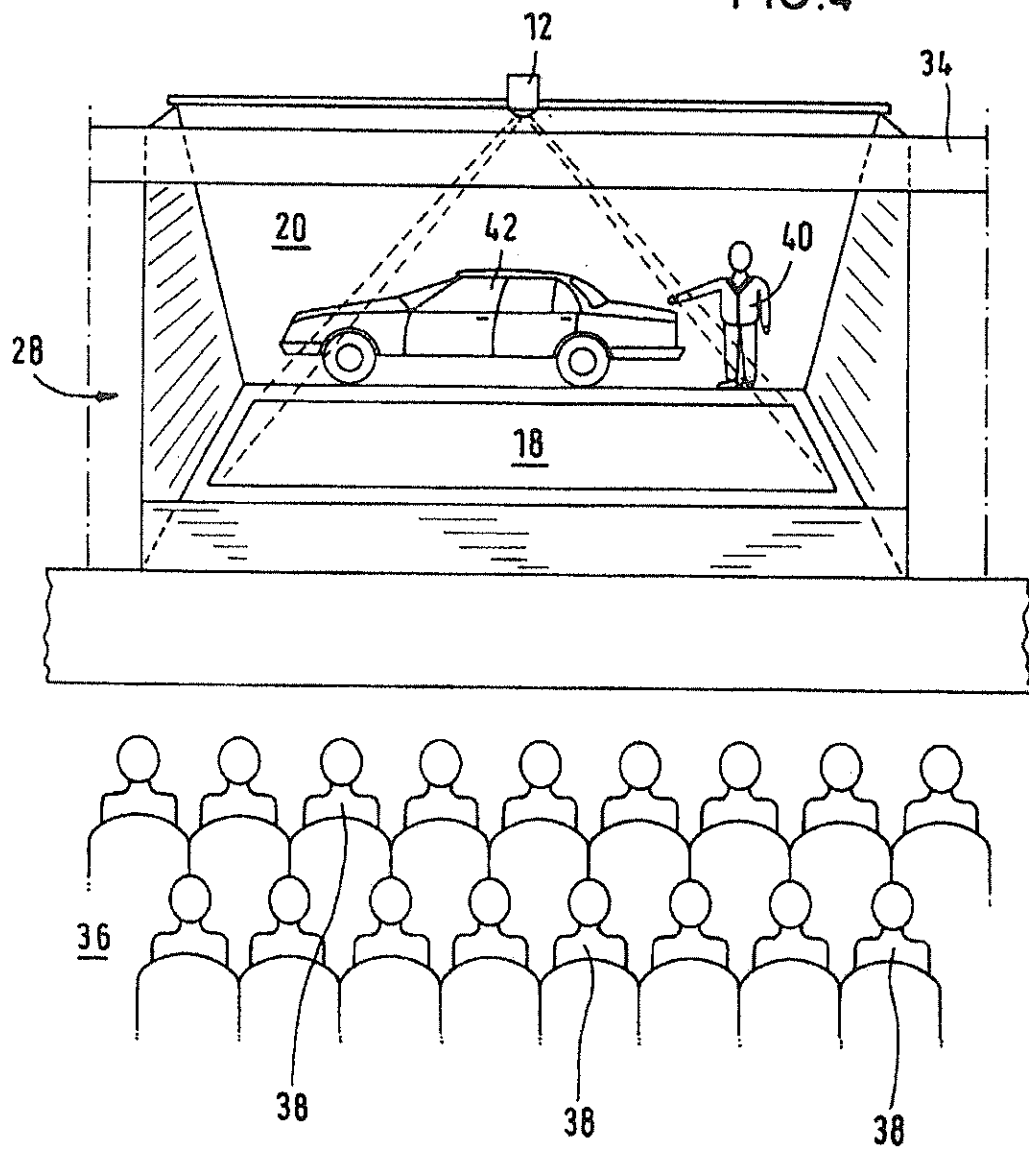
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FIG. 4



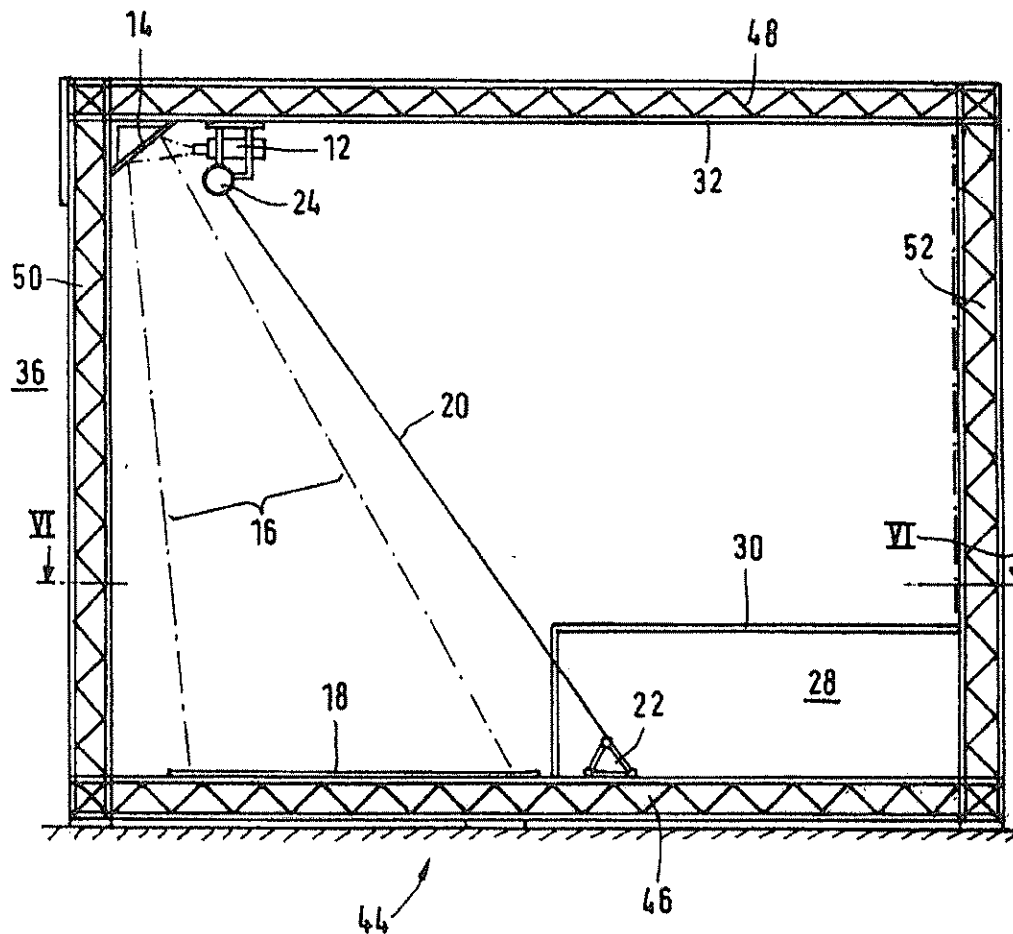
U.S. Patent

Feb. 2, 1999

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FIG. 5



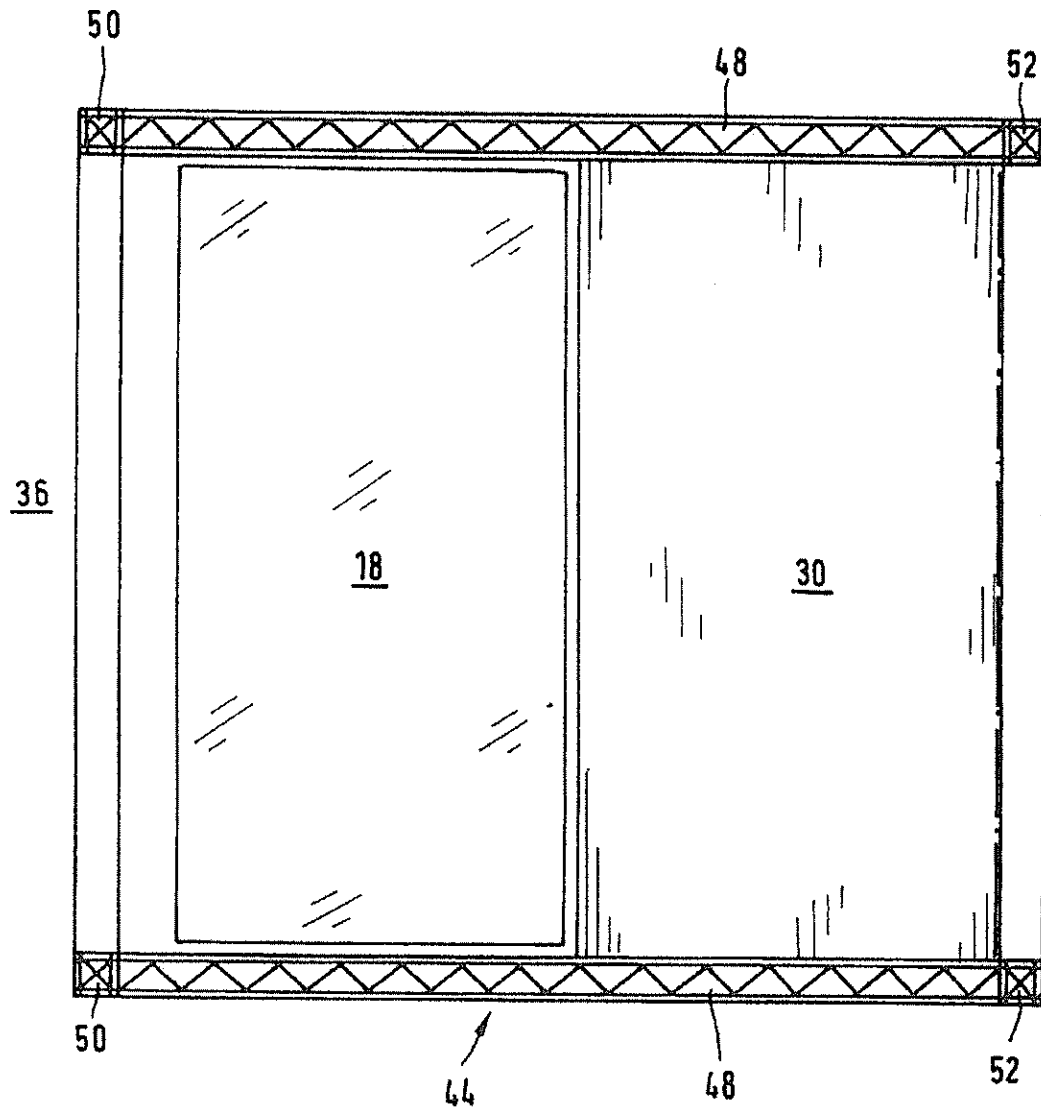
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FIG. 6



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DEVICE FOR DISPLAYING MOVING IMAGES IN THE BACKGROUND OF A STAGE

The invention concerns an apparatus for representing moving images in the background of a stage or the like using an image source.

Transparency lectures or presentations are known, and that expression is a well-established piece of terminology. In a transparency presentation the presenter projects still images or pictures on to a projection screen. The presenter himself stands outside the light cone between the projector and the projection screen and comments on the images. Instead of the transparency projector the presenter can also use a film apparatus. In that case moving images appear on the projection screen and the presenter comments thereon. In both cases the presenter stands outside the light cone. He does not appear on or in the image himself. If he were to move into the light cone he would mask off a part of the light beam. Instead of the image, the shadow of the presenter would then appear on the projection screen. If the presenter wants to direct the attention of his viewers to a given point in the image he uses for that purpose a pointer or a light with a sharply focussed light beam.

The foregoing kind of presentation is sufficient for image and film presentations for photographic and film amateurs. Travellers who show films or transparencies of their travels to a wide circle of viewers can also use that kind of presentation without detriment. The viewers are only interested in the film or the transparencies and the words of the presenter. They attribute only slight significance to the manner of presentation and the technical equipment involved.

The position is different if the viewers do not have any particular interest in the articles to be shown and an interest first has to be aroused. The position is also different when the film presentation is to take place at a high technical level, for overriding reasons. The situation is also different if the film presentation is to be made more relaxed and less monotonous and linked to so-called display effects.

A theatre production is described as a ghost trick in the literature (for example Bühnentechnische Rundschau, BTR 3/1990, pages 24 and 25), involving disposing a pane of glass inclinedly in the front region of the stage. An actor is positioned beneath the pane of glass and in a lowered part of the stage. He is bedecked with wide white garments and represents the ghost. He is lit by a spotlight which is also disposed under the stage. The image of that actor representing the ghost is projected on to the pane of glass and appears to the viewers behind the pane of glass a virtual image. In that theatre presentation a second actor is on the stage. He represents a hero or sorcerer who conjures up the ghost.

On the basis thereof, the object of the present invention is an apparatus with which film and image presentations can be made relaxed and the presenter himself can move into the image without thereby interfering with reproduction of the image on a projection screen or generally on a surface. In accordance with the invention, that object is attained in an apparatus of the kind set forth in the opening part of this specification, in that a reflecting surface is arranged on the floor of the stage in the central region thereof, a transparent smooth foil extends between the floor and the top or ceiling of the stage over the entire width thereof in such a way that its lower end is held to a position between the reflecting surface and the background and its upper end is held to the ceiling at a position which is disposed further forwardly, and the image source is arranged at the ceiling in front of the

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upper end of the foil which is held there, and is directed on to the reflecting surface.

The apparatus according to the invention makes use of the physical principle that any motor car driver experiences on the windshield of his vehicle. An article lying on the storage surface in front of the windshield is reflected therein in such a way that it seems to the motor car driver to be disposed in front of the windshield, as viewed in the direction of travel. In the case of the apparatus according to the invention the article to be represented is projected by the image source on to the reflecting surface which corresponds to the above-mentioned support surface, and it is then reflected in the transparent smooth foil in such a way that it appears to the viewer on the background of the stage. The foil which extends over the entire width of the stage and which is held to the floor and ceiling thereof acts like the windshield in a motor vehicle. A viewer at any point in the auditorium believes that he is seeing any article reflected by the reflecting surface on to the foil, behind same. The presenter stands on the stage outside the light cone of the image source. As viewed from the auditorium, he stands behind the reflecting surface. That means that his image is not formed on the background, nor does he disturb the image representation thereon. He can draw the attention of the viewers to given details in the image representation, without making use of a pointer or a light. He can likewise move with the images and interpret the reproduction thereof by virtue of his body language.

Desirably the foil extends at an angle of about 45° relative to the floor of the stage. The image source can be a display screen tube with a very high degree of resolution. It can be controlled by a computer. That means that the image can also be electronically influenced. Desirably a computer-controlled intelligent light amplifier (also known as an ILA) is used as the image source. It is oriented horizontally and emits light in the direction of the auditorium. Accordingly its longest extent lies in the horizontal and it can be easily concealed from the viewers. So that the light which it radiates reaches the reflecting surface, a further embodiment provides that a mirror is arranged in front of the computer-controlled light amplifier and the latter is directed on to the mirror and the mirror receives the light emitted by the light amplifier, is directed on to the reflecting surface and projects the light on to same.

If possible the viewer should not notice how the image in the background of the stage is produced. Therefore the light amplifier and the mirror are desirably covered over forwardly by a curtain or a board which extends over the entire width of the stage. The foil itself is under a very high tensile stress of up to 8t. In that way it is held tautly smooth and the image is not distorted. The foil is preferably without any inclusions. It is also to be very smooth on its front side and its rear side. It is also to be very thin. Finally the foil is to reflect between 30 and 50%, preferably 30%, of the light impinging on it. Such a foil is particularly well suited for the purposes according to the invention. The absence of inclusions and the smooth front and rear sides thereof result in very slight and imperceptible distortion effects. The fact that the foil is very thin serves the same purpose. Reflection phenomena at the front and rear sides thereof thus coincide. The foil used for the purposes according to the invention is generally subjected to further processing as transparency or 35 mm films. When used as a transparency film, it is cut up into the format of the transparency or 35 mm films. When it is used for the invention the foil has a surface area of at least 3 m times 4 m.

In a desirable embodiment the foil is rolled on to a winding tube. It is suspended therewith at the ceiling of the

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stage. Desirably it is fixed to the ceiling, together with the intelligent light amplifier. The free end of the foil can be pulled off the winding tube and is fixed to the floor of the stage. A support mounting arranged on the floor of the stage is used for that purpose.

The reflecting surface may be a white projection screen which is to be laid on to the floor of the stage. The reflecting surface however may also be a simple white coat of paint. As the presenter moves outside it and more specifically behind it, it retains its reflecting properties for a very long period of time.

The apparatus according to the invention is advantageously used in connection with a stage with a floor which can be raised and lowered. The reflecting surface, the projection screen, the coat of paint or the like, is disposed on that part of the floor, which can be raised and lowered. When the floor is lowered the spacing between the image source and the reflecting surface is increased. As a result the virtual image which appears in the background of the stage is displaced rearwardly.

The apparatus according to the invention is to be easy to transport from one location to another and to set up at different locations. For that purpose, in a desirable embodiment, the invention provides that its components are enclosed by a lattice frame and can be secured thereto. Desirably, the lattice frame has units which can be set up on the two sides of the apparatus or the stage thereof and which each have a lower girder portion, an upper girder portion, a front girder portion and a back girder portion. The lattice frame units which can be set up on the two sides of the apparatus or stage can be connected together by transversely extending struts.

Desirably the winding tube is secured to the upper girder portions by way of brackets while the mounting support which holds the free end of the foil is fixed to the lower girder portions.

The invention will now be further described by way of the example of the embodiments illustrated in the drawing in which:

FIG. 1 is a simplified diagrammatic side view of the apparatus according to the invention,

FIG. 2 is a more detailed diagrammatic side view of the apparatus according to the invention, simultaneously showing the auditorium,

FIG. 3 is a side view of the stage similarly to the illustration in FIG. 2 with the floor lowered,

FIG. 4 is a view of the auditorium and the stage looking in the direction of the line IV—IV in FIG. 2,

FIG. 5 is a side view of the apparatus according to the invention when using the lattice frames surrounding it, and

FIG. 6 is a view in the direction of the line VI—VI.

FIG. 1 shows the physical principle of the apparatus according to the invention with the computer-controlled intelligent light amplifier 12 which acts as an image source, the mirror 14 which in the view in FIG. 1 is arranged to the left in front of it and which projects the light radiated on to it from the light amplifier 12 on to the reflecting surface 18 in the form of a light cone 16 as indicated by two broken lines, the foil 20 with its lower holding means in the form of a mounting bracket 22 and its upper holding means in the form of a winding tube 24 and the virtual image 26 which is represented in the background of the stage. The computer-controlled intelligent light amplifier 12 projects a moving image on to the mirror 14. This projects it on to the reflecting surface 18 which projects it on to the foil 20. From the point of view of a viewer who is at the left in FIG. 1—see FIG. 2—a moving image appears in the background as a virtual image 26.

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FIGS. 2 and 3 show a practical application of the apparatus according to the invention at a presentation or lecture function. More specifically FIG. 2 again shows the stage 28, the floor 30 thereof and the ceiling 32 thereof. Extending under the ceiling 32 of the stage 28 over the entire width thereof is a curtain or a cover rail or board 34. It covers over in a forward direction the computer-controlled intelligent light amplifier 12 and the mirror 14. The viewers 38 sit in the auditorium 36. The presenter or lecturer 40 stands on the stage 28 behind the reflecting surface 18. The reflecting surface 18 is for example a projection screen or a coat of white paint. The double-headed arrow shown under the floor 30 is intended to indicate that it can be raised and lowered. FIG. 2 shows the floor 30 at its normal height. The virtual image 26 appears in the background of the stage 28 at a given location. FIG. 3 shows the same stage 28 with the floor 30 lowered. When the floor 30 is lowered the virtual image 26 moves rearwardly, towards the right when looking at FIGS. 2 and 3.

FIG. 4 shows a practical application of the apparatus according to the invention in a presentation function relating to motor vehicles. FIG. 4 shows a presentation article 42, in this example being a motor vehicle. The viewers 38 see it in the background as a virtual image. They do not recognise that this involves a reflection at the reflecting surface 18 and the foil 20. They only see how the presenter 40 moves freely in front of the motor vehicle, points with his arms and hands to the motor vehicle and parts thereof, explains details in words, and in so doing neither interferes with nor in any way influences the reproduction of the motor vehicle in the background in the form of the virtual image 26.

FIGS. 5 and 6 show the transportable embodiment of the apparatus according to the invention, which can be set up at any desired location. Lattice frames 44 which can be set up at both sides of the apparatus serve for that purpose. Each lattice frame comprises a lower girder portion 46, an upper girder portion 48, a front girder portion 50 and a back girder portion 52. Lattice frames of that kind are known. Each girder portion comprises a plurality of parts which can be releasably connected together. For the purposes of erecting the apparatus, the parts of the girder portions are fitted together and joined together. For transportation purposes they are separated from each other and can be transported in the form of comparatively small units on a truck or the like.

As shown in FIG. 5 the computer-controlled intelligent light amplifier 12 and the winding tube 24 are fixed to a bracket. The bracket is in turn fixed to a transverse strut which connects the two upper girder portions 48. The same applies in regard to the mirror 14. When the apparatus is erected the foil 20 is pulled off the winding tube 24, fixed to the mounting bracket 22 and then tensioned. The reflecting surface 18 is laid on the floor in the form of a plate or the like which is coated or painted white, or in the form of a projection screen. The stage 28 on which the presenter 40 stands when making his presentation is composed of parts which are known per se on their own and it is erected in the rearward region of the apparatus.

I claim:

1. Apparatus for representing moving images in the background of a stage using an image source, said stage including a floor, a ceiling disposed vertically above said floor and a background disposed therebetween, said apparatus characterised in that a reflecting surface (18) is arranged on said floor (30) of said stage (28) in the central region thereof, a transparent smooth foil (20) extends between said floor (30) and said ceiling (32) at a position which is disposed further forwardly, and the image source is arranged at the ceiling

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(32) in front of the upper end of the foil (20) which is held there, and is directed on to the reflecting surface (18).

2. Apparatus as set forth in claim 1 characterised in that the foil (18) extends at an angle of about 45° relative to the floor (30) of the stage (28).

3. Apparatus as set forth in claim 1 or claim 2 characterised in that the image source is a computer-controlled intelligent light amplifier (12).

4. Apparatus as set forth in claim 3 characterised in that a mirror (14) is arranged in front of the computer-controlled light amplifier (12) and said light amplifier is directed on to the mirror (14) and the mirror (14) receives the light radiated from the light amplifier (12), is directed on to the reflecting surface (18) and projects the light on to said reflecting surface.

5. Apparatus as set forth in claim 4 characterised in that the light amplifier (12) and the mirror (14) are covered over forwardly by a curtain extending over the entire width of the stage (28).

6. Apparatus as set forth in claim 1 characterised in that the foil is subject to a tensile stress.

7. Apparatus as set forth in claim 6 characterised in that the foil (20) has a surface area of at least 3 m times 4 m.

8. Apparatus as set forth in claim 7 characterised in that the foil (20) is rolled on a winding tube (24) and can be pulled off same and can be fixed with its free end in a support mounting (22).

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9. Apparatus as set forth in claim 1 characterised in that the reflecting surface (18) is a coat of white paint.

10. Apparatus as set forth in claim 1 characterised in that the reflecting surface (18) is a white projection screen.

11. Apparatus as set forth in claim 1 characterised in that the floor (30) of the stage (28) can be raised and lowered.

12. Apparatus as set forth in claim 4 characterised in that light amplifier (12), mirror (14), reflecting surface (18), foil (20) and stage (28) are enclosed by a lattice frame (44) and can be fixed thereto.

13. Apparatus as set forth in claim 12 characterised in that the lattice frame (44) includes two units which can be set up on both sides of the stage (28) and each unit has a lower girder portion (46), an upper girder portion (48), a front girder portion (50) and a back girder portion (52).

14. Apparatus as set forth in claim 13 characterised in that the two lattice frame units which can be set up on both sides of the stage (28) can be connected by transversely extending struts.

15. Apparatus as set forth in claim 4 characterised that the light amplifier (12) and the mirror (14) are covered over forwardly by a cover bar (34) extending over the entire width of the stage (28).

* * * * *

EXHIBIT B



US007883212B2

(12) **United States Patent**
O'Connell et al.

(10) **Patent No.:** **US 7,883,212 B2**

(45) **Date of Patent:** **Feb. 8, 2011**

(54) **PROJECTION APPARATUS AND METHOD
FOR PEPPER'S GHOST ILLUSION**

(56) **References Cited**

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(76) Inventors: **Ian O'Connell**, c/o Musion Systems Limited, Covden House, 7a Langley Street, London (GB) WC2H 9JA; **James Rock**, c/o Musion Systems Limited, Covden House, 7a Langley Street, London (GB) WC2H 9JA

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 1129 days.

(Continued)

(21) Appl. No.: **10/599,553**

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(22) PCT Filed: **Apr. 1, 2004**

EP 0 919 258 6/1999

(86) PCT No.: **PCT/GB2004/001414**

§ 371 (c)(1),

(2), (4) Date: **Sep. 30, 2006**

(Continued)

(87) PCT Pub. No.: **WO2005/096095**

PCT Pub. Date: **Oct. 13, 2005**

Primary Examiner—Georgia Y Epps
Assistant Examiner—Ryan Howard
(74) *Attorney, Agent, or Firm*—Thomas, Kayden, Horstemeyer & Risley, LLP; Larry W. Brantley

(65) **Prior Publication Data**

US 2007/0201004 A1 Aug. 30, 2007

(57) **ABSTRACT**

(51) **Int. Cl.**
G03B 21/00 (2006.01)
G03B 21/56 (2006.01)
G02B 27/22 (2006.01)
A63G 31/00 (2006.01)
A63J 5/00 (2006.01)

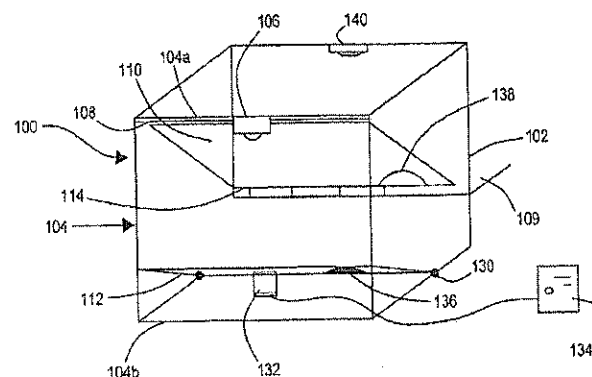
(52) **U.S. Cl.** 353/10; 359/449; 359/478; 472/63

(58) **Field of Classification Search** 353/10, 353/74, 79, 119, 122, 28; 359/443, 449, 359/447, 478, 479, 630; 472/58, 61, 63

See application file for complete search history.

An image projection apparatus (100) comprises a projector (106), a frame (108), and a partially transparent screen (110). The frame (108) retains the screen (110) under tension, such that the screen (110) is inclined at an angle with respect to a plane of emission of light from the projector (106). The screen (110) has a front surface arranged such that light emitted from the projector (106) is reflected therefrom. The projector (106) projects an image such that light forming the image impinges upon the screen (11) such that a virtual image is created from light reflected from the screen (110), the virtual image appearing to be located behind the screen (110).

18 Claims, 4 Drawing Sheets



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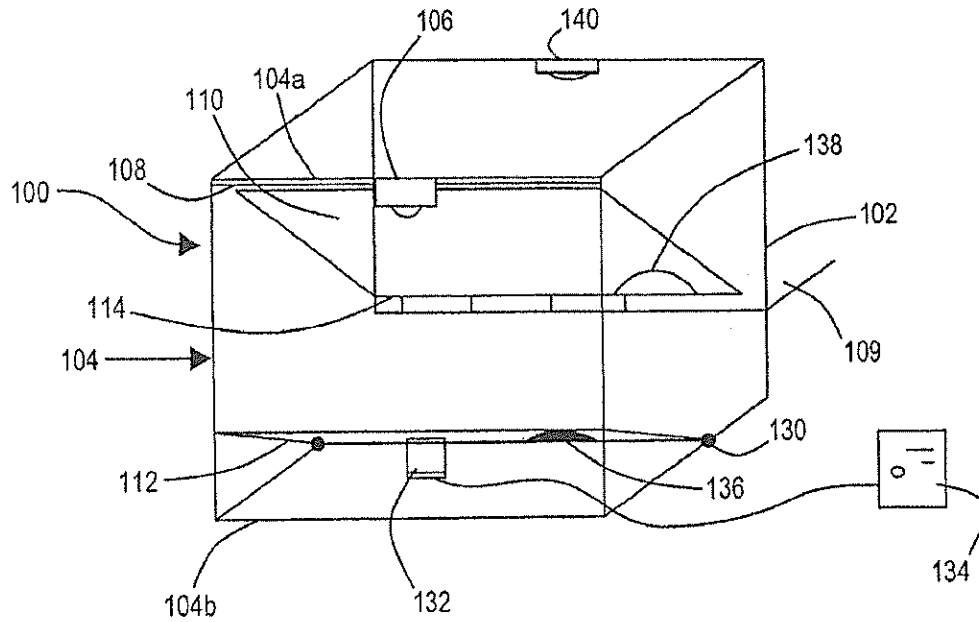


Fig. 1

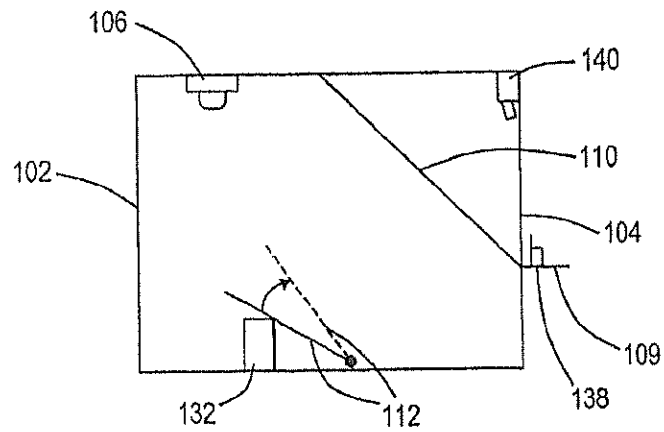


Fig. 2

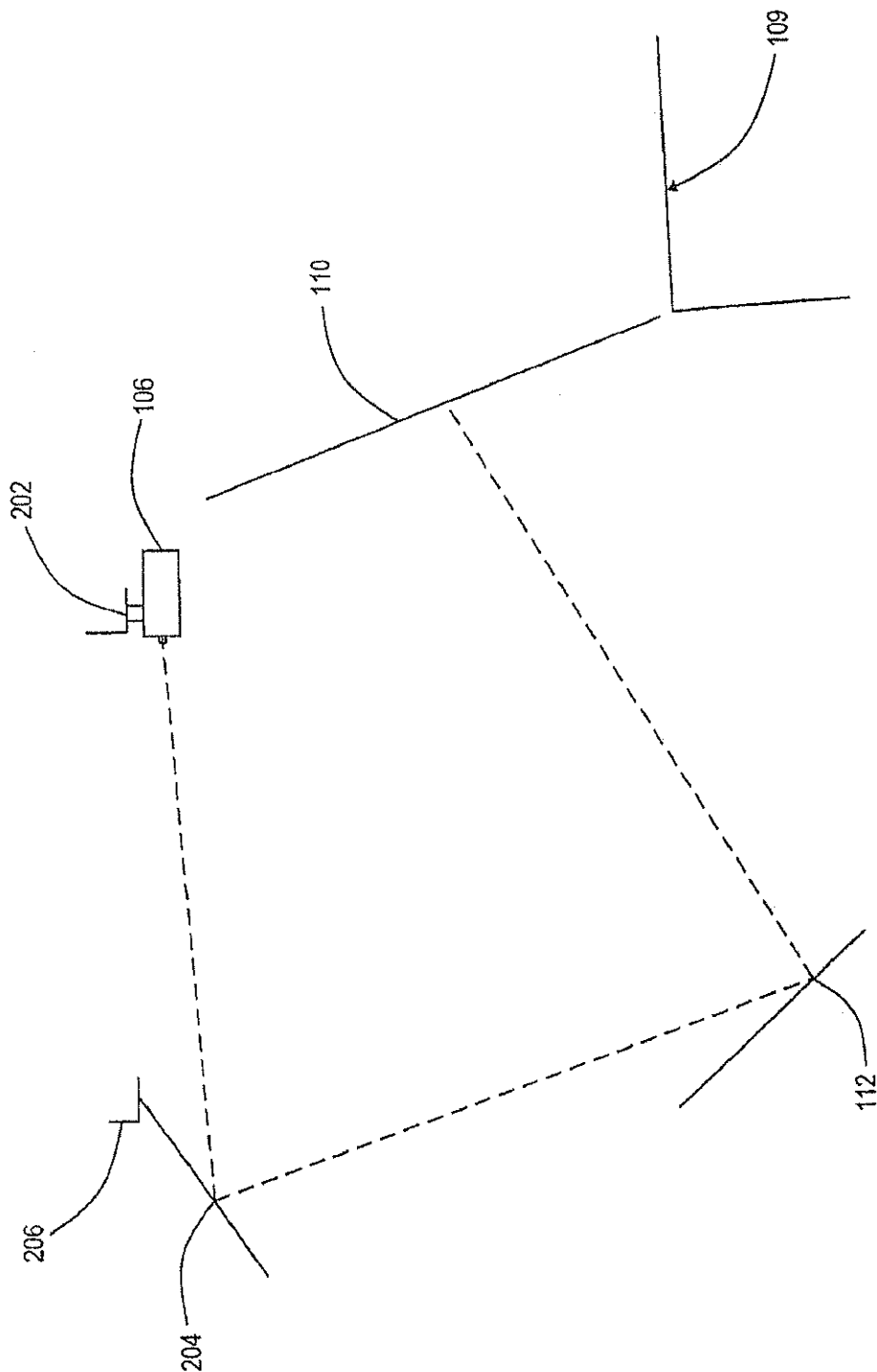


Fig. 2a

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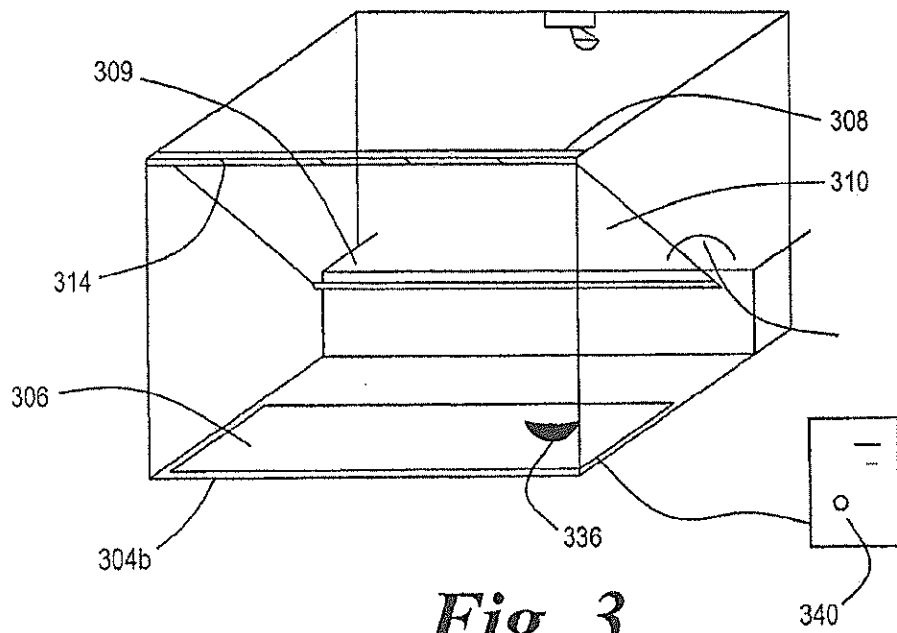


Fig. 3

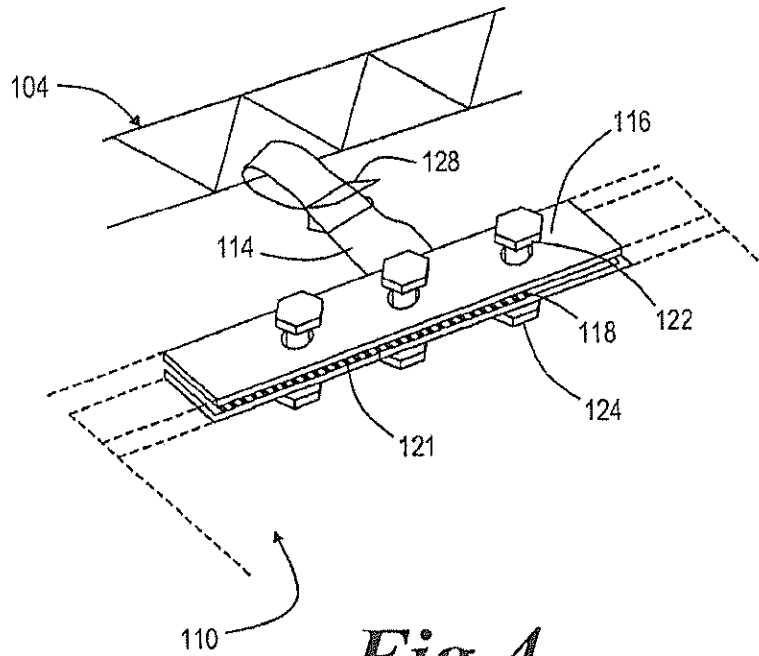
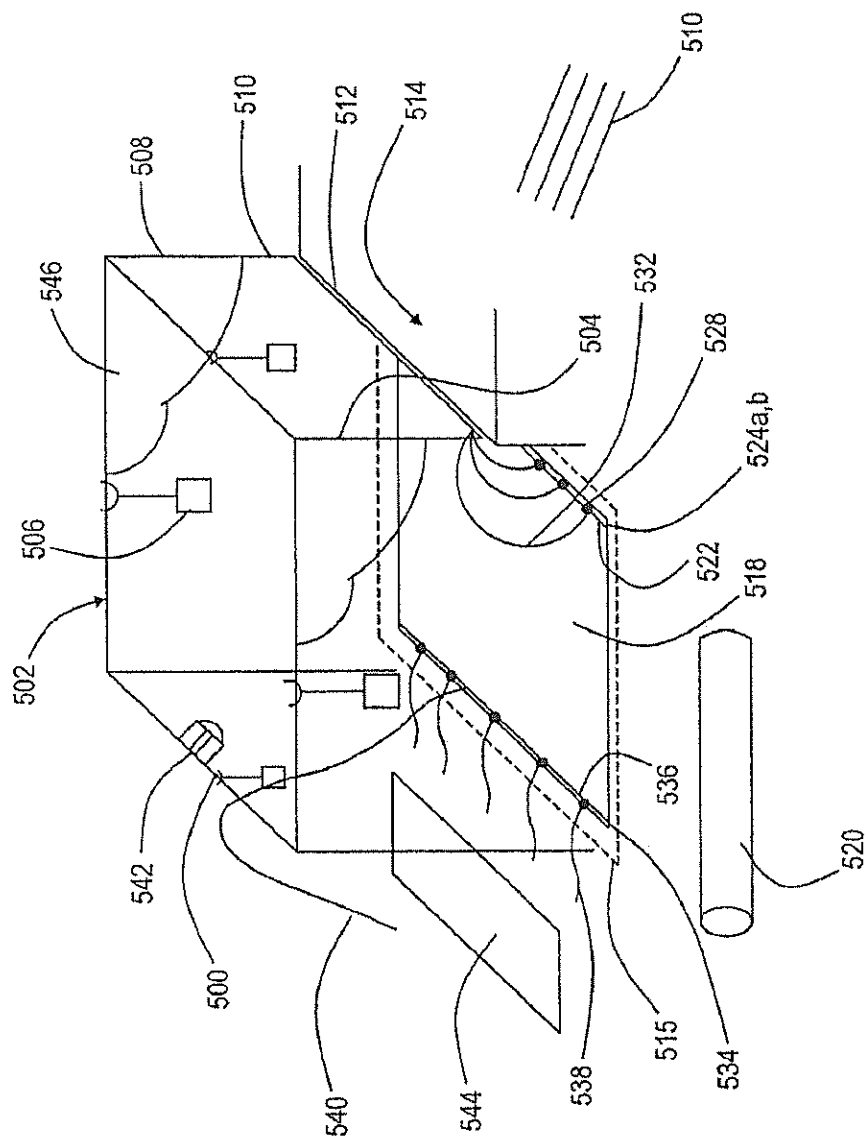


Fig. 4



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PROJECTION APPARATUS AND METHOD FOR PEPPER'S GHOST ILLUSION

This invention relates to a projection apparatus and method. More particularly, but not exclusively, it relates to a projection apparatus arranged to project an image of an object upon an inclined, partially reflective, screen so as to give a false perception of depth and a method for constructing such an apparatus.

BACKGROUND OF THE INVENTION

The projection of an image upon a partially reflective screen such that is observable by a viewer positioned in front of the screen is known, the so-called "Peppers ghost" arrangement that is known from fairground shows.

This has been applied to publicity and promotional displays where a presenter resides behind an inclined, partially reflective screen, typically a tensioned foil, onto which an image of, for example, a motor vehicle is projected, via at least one reflective surface, see for example EP 0799436. The location of the presenter behind the projected image has a number of inherent advantages over systems where the presenter stands in front of a screen, not least of which is that the presenter does not obscure the projected image when walking across the projected image. Additionally, the use of an inclined screen results in a viewer of the image perceiving the image as having depth rather than merely being a two dimensional image, for example where a motor vehicle is seen to rotate upon a turntable.

However, current image projection apparatus' do have a number of problems associated with them, for example, mounting of the foil can prove difficult which in turn leads to uneven tensioning of the foil and wrinkles upon the foil, that impair the viewed quality of the image projected onto the foil. Also, in mounting the foil the foil must be laid out upon a clean dust free piece of cloth or plastic sheet, which is larger than the foil, in order to prevent particles adhering to the foil, such particles can scratch the surface of the foil and impair the viewed quality of the projected image or act as scattering centres from which projected light is incoherently scattered, thereby detracting from the viewed quality of the image as this scattered light does not contribute to the viewed image.

Also, as the illusion of peppers ghost relies on the reflected image formed by light contrasting with its immediate surroundings and background. The stronger the reflected image, the more solid that reflected image looks, the more vibrant the colours will be, and the more visible the reflected image is to an audience. In circumstances where the presenter may be unable to control high levels of ambient light forward of the foil, e.g. from an auditorium at a trade show, the high level of ambient light results in significant levels of reflection of the ambient light from the screen detracting from the strength of the reflected image over the background. In these circumstances a bright projector (8000 lumens+) is desirable. However, the use of a bright projector results in unwanted light hitting the projection surface and reflecting through the foil to create a milky hue upon the stage and around the area where the reflected image appears.

Another problem with current image projection apparatus is that projectors used with such apparatus are very powerful, typically 8,000 to 27,000 lumens and consequently project a significant amount of light into areas of an image where there is no object within the image. This is an inherent feature of projectors and results in low contrast ratios which leads to a milky hue spread over the part of the film where the projector is creating an image when the projector is switched on. The

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milky hue is clearly undesirable as it detracts from the viewer's perception that there is no screen present.

The level of the milky hue relative to the brightness of the image is, at least partially, determined by the level of contrast ratio offered in the projector. The higher the contrast ratio, then the brighter the image can be relative to the brightness level of the milky hue. Even projectors with contrast ratios as high as 3000:1 still emit a milky light hue when used in a "Pepper's Ghost" arrangement.

A further problem associated with some projectors is the "keystone" effect, in which distorted, typically elongated, images (up and down) occur due to angled projection. This is of particular relevance where depth perception is of importance. The solution employed in modern, expensive projectors is to employ digital correction of keystone distortions. However, older, less-expensive or even some specialist High Definition projectors do not employ such digital keystone correction and are therefore difficult to configure for use with current image projection apparatus. High definition (HD) projectors do not offer keystone adjustment because when keystone correction is attempted in conjunction with the increased number of pixels about an image's edge causes the pixels about the edge of the image to appear 'crunched'. Additionally, when processing moving images HD projectors compromise projector processing speed. When the processing power is used to carry out both keystone correction and motion processing the image is seen to jerk during movements, an effect known as "chokking". In general, it can be said that the use of electronic keystone correction to alter a video image will result in the degradation of picture quality compared to an image which is not subject to such a process.

Additionally, current systems do not allow for the projected image to apparently disappear and re-appear from behind a solid 3D object placed upon the stage, as the screen lies in front of the presenter and closest to the viewing audience.

BRIEF SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a image projection apparatus comprising a projector, a frame, and an at least partially transparent screen;

the frame being arranged to retain the screen under tension, such that the screen is inclined at an angle with respect to a plane of emission of light from the projector;

the screen having a front surface arranged such that light emitted from the projector is reflected therefrom; and

the projector being arranged to project an image such that light forming the image impinges upon the screen such that a virtual image is created from light reflected from the screen, the virtual image appearing to be located behind the screen.

Such an apparatus is advantageous over present systems in that the screen need not be coated with an expensive, partially reflective coating, an angular dependence of reflectivity of transparent dielectric materials can be used to bring about partial reflectance of the projected image. Thus, this apparatus simplifies the manufacture of such systems and also reduces their production costs. Additionally, the use of a frame frees the screen from having to be fixed directly to a ceiling, or a floor, and therefore increases the utility of apparatus over the prior art systems.

The screen may be a foil. The foil may be rolled about a cylinder when not in use. The screen may be inclined at approximately 45° to the plane of emission of light from the projector. The screen may comprise a partially reflective layer upon the front surface.

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The use of a foil screen reduces the weight of the apparatus, this allows ready transportation of the apparatus between sites. Rolling the foil onto a cylinder when not in use serves to protect the foil from damage during transportation and also allows ready transportation of the apparatus between sites. The use of a partially reflective screen can increase the degree of light reflected from the screen and can increase the audience perceived strength of the virtual image.

The screen may be attached to the frame at the screen's upper and/or lower edges. The frame may comprise first and second retention members arranged to sandwich an edge region of the screen therebetween. At least one of the first and second retention members may comprise an abrasive coating, typically sandpaper, arranged to contact the screen. The first and second retention members may comprise respective openings therethrough that may be arranged to collocate with openings in respective jaws of clamping members attached to tensioning straps, the openings may be arranged to receive a fixing means so as to clamp the screen between the first and second retention members. The tensioning straps may be attached to a truss arrangement and may be adjustable such that the tension of the screen within the truss arrangement can be varied about the periphery of the screen. Preferably, the retention members are substantially parallel to truss members comprising the truss arrangement.

The use of a variable tensioning arrangement allows wrinkles upon the screen to be minimised, and ideally eradicated to present a smooth surface for upon which the image can be projected. An abrasive surface upon at least one of the retention members increases the grip between the retention member and the screen thereby reducing the likelihood of the screen slipping when held by the retention member.

The apparatus may comprise a pigmented reflective member in an optical pathway between the projector and the screen. The pigmented member may reflect only part of the visible spectrum of light, typically the pigmented member will appear grey or white to a viewer.

It has been found that the use of a grey reflective member in the optical pathway between the projector and the screen reduces the outline of the reflective member upon the screen compared to when a white reflective member is used, and also reduces the level of the milky white hue associated with the projector emitting light where there is no image of an object to be projected.

The pigmented reflective member may be inclined at an angle with respect to the plane of emission of light from the projector. The angle of inclination of the member with respect to the plane of emission of light from the projector may be variable. The member may comprise a plurality of sections each of which may have an independently variable angle of inclination with respect to the plane of emission of light from the projector.

The inclination of the reflective member can compensate, at least partially and in some instances completely, for keystone effect. The variation of the angle of inclination or distance of the reflective member allows for a variation of the apparent depth and/or position of an object when projected upon the screen. This is because the virtual image appears as far behind the screen as the real image is in front of the screen.

There may be a reflective device, typically a mirror, arranged to direct light projected from the projector on to the reflective member. Typically, the reflective device is mounted upon an upper part of the framework. The reflective member may be parallel, or substantially parallel, to the reflective device. In some embodiments the projector may be mounted upon an upper truss of the framework and may be aligned with

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the horizontal, typically light projected from the projector is directed on to the reflective device.

Such an arrangement compliments the keystone correction achievable by the inclination of the screen and the reflective member and is particularly useful where an HD projector is used in order to compensate for the keystone effect without the use of the projector's processing power.

The reflective member may comprise a mask corresponding to the apparent location of a prop in the screen to an audience. Typically, the mask will absorb light over at least a fraction of the visible spectrum and preferably the mask will be black. The mask may be arranged to produce an area upon the screen upon which the image is not projected. The mask may vary in extent and shape, for example by the use of a sliding element that is moved in and out of position upon the reflective member.

The mask can be used to make the illusion of an article disappearing and reappearing behind a prop that is placed upon a stage, either behind or in front of the screen.

The apparatus may comprise a light source arranged to selectively illuminate an area of stage comprising the prop. The light source may be a white light source. Lighting the prop causes the prop to become more visible and better defined against the dark, typically black, background. This enhances the three dimensional effect of the projected image interacting with the prop.

Also directing bright light upon the prop serves to reduce the contrast ratio of the projected image upon the prop, which typically remains slightly visible even when a mask is used in the prop's shadow upon the reflective member, thus enhancing the illusion of the projected image disappearing behind the prop.

The apparatus may comprise a light source arranged to illuminate at least part of a stage. The light source may be located to the rear of the screen, typically along a top edge of the frame and/or along either side of the stage. The apparatus may comprise a plurality of light sources. The apparatus may comprise a lighting desk equipped with faders arranged to control the level of each light source, or selection means arranged to selectively control the supply of power to each light source.

Such a light source is used in order that the colour and light levels of the area immediately surrounding the peppers ghost image, the stage background, can most closely match the colour of the projection surface background, excluding the area on both which is carrying the image. This, reduces the milky hue perceived by the audience. The use of a plurality of light sources increases the uniformity of lighting of the stage, in order to produce a similar effect to the way light emitted from a projector hits the projection screen. By controlling each light source separately the lighting levels upon the stage can be controlled to closely match the levels of light as dictated by the show performance, or the levels of unwanted light hitting the projection surface of the screen.

The projector may comprise a standard projector, for example a JVC ML4000, or a Barco G5. Alternatively, the projector may comprise an LCD, or a television display. The display may comprise at least one element arranged to be non-emitting in response to control from a processor. The at least one element may form a mask arranged to produce an area upon the screen upon which the image is not projected. The mask may correspond to the shape and location of a prop upon stage. The prop may be three dimensional.

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According to a second aspect of the present invention there is provided a method of providing a projection apparatus comprising the steps of:

- (i) resting a frame upon a number of elevation means;
- (ii) attaching leg sections to the frame;
- (iii) increasing the height of the elevation means;
- (iv) adding further leg sections;
- (v) attaching a lower edge of a screen to a lower rear piece of the frame;
- (vi) raising an upper edge of the screen to adjacent an upper front section of the frame; and
- (vii) attaching the upper edge of the screen to the upper front section of the frame.

The method may comprise providing the elevation means in the form of a jack.

The method may comprise providing the screen in the form of a film. The method may comprise removing a roll of screen film from a protective cylindrical casing. The method may comprise laying the screen upon a dust-free protective sheet.

The method may comprise placing the lower edge of the screen between jaws of a first retention member and may further comprise securing the screen in position using a fixing means passing through the retention member and the screen and a locking means arranged to lock the fixing means being arranged to secure the locking means in position. The method may comprise providing the fixing means in the form of a bolt and the locking means in the form of a nut.

The method may comprise attaching tensioning means to the retention member adjacent at least some of the fixing means.

The method may comprise attaching the tensioning means to the lower rear piece of the frame.

The method may comprise attaching a second retention member to an upper edge of the film screen, typically in the same manner as the first retention member is attached to the lower edge. The method may comprise attaching tensioning means to the second retention member. The method may comprise providing the tensioning members in the form of ratchet straps.

The method may comprise attaching a rope to the second retention member and passing the rope over the upper frame and using the rope in step (vii) to raise the screen.

The method may include tensioning each of the tensioning means such that the screen is flat and substantially wrinkle free.

The method may include depending a projector from the upper frame.

The method may include placing a pigmented reflective board between the screen and a front edge of the frame. The method may comprise reflecting light emitted by the projector from the board onto the screen.

The method may comprise forming the frame form a truss work.

According to a third aspect of the present invention there is provided a projection apparatus constructed according to the second aspect of the present invention.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

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FIG. 1 is a schematic representation of a first embodiment of a projection apparatus according to at least an aspect of the present invention;

FIG. 2 is a side view of a the projection apparatus of FIG. 1 showing a pigmented reflective member in first and second positions;

FIG. 2a is a schematic representation of an alternative projection arrangement, suitable for use with the apparatus of FIGS. 1 and 2;

FIG. 3 is a schematic representation of a second embodiment of a projection apparatus according to at least an aspect of the present invention;

FIG. 4 is a perspective view of a screen clamping arrangement of FIGS. 1, 2 and 3; and

FIG. 5 is a schematic view of a projection apparatus being constructed according to the second aspect of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGS. 1, 2 and 4, a projection apparatus 100 comprises a box frame 102 formed of trusses 104, a projector 106, a support frame 108, a screen 110 held within the support frame 108 and a grey pigmented reflective board 112.

The projector 106 depends from a front upper cross-piece truss 104a of the box frame 102. The board 112 lies below the projector 106 at the base of the box frame 102. The screen 110, is inclined at approximately 45° to the horizontal and the front edge of the screen 110 is proximate the front upper cross-piece truss 104a of the box frame 102 and the rear edge of the screen is proximate a stage 109 that lies to the rear of the box frame 102.

The screen 110 is typically a polymeric foil, which can have a partially reflective coating upon a front face of the foil. The screen 110 is retained within the box frame 102 by means of tensioning straps 114 attached to the box frame 102, at the top and bottom edges of the screen 110. At a free end of each of the tensioning straps 114 there is pair of clamp jaws 116 which have respective openings 118, 120 passing therethrough. The faces of the jaws 116 are optionally coated with an abrasive 121, such as sandpaper, in order to enhance the grip of the jaws 116 upon the screen 110.

Edges of the screen 110 are placed between the jaws 116 and a bolt 122 is placed through the openings 118, 120 and passes through the screen 110. A nut 124 is threaded onto the bolt 122 and tightened to hold the screen 110 between the jaws 116. The tensioning straps 114 pass through the trusses 104 and are tightened using a friction locking buckle arrangement 128.

Each of the tensioning straps 114 can be tightened or loosened individually so as to allow an even tension to be applied over the whole surface of the screen 110 thereby reducing, and ideally eliminating, the formation of wrinkles upon the screen 110 which reduce the quality of an image projected upon the screen 110.

The reflective board 112 lies below the projector 106 adjacent to a lower front cross-piece truss 104b of the box frame 102. The projector 106 is directed such that light emitted by the projector 106 strikes the reflective board 112. The board 112 is inclined so that the light emitted by the projector 106 is reflected upwards from the board 112 onto the screen 110. The use of a grey, or otherwise coloured board 112 reduces the milky hue associated with light from the projector where there is no image to be projected.

A fraction of the projected light striking the screen 110 is reflected from the front surface of the screen 110 where is can

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be viewed by an audience. A presenter upon the stage 109 behind the screen 110 can also be viewed by the audience but does not interfere with the viewing of the image by the audience.

The board 112 is connected to a hinge arrangement 130 along a rear edge thereof. The hinge arrangement 130 allows the board 112 to be raised and lowered, typically by a hydraulic ramp 132 controlled by a computer 134, in order to compensate for the 'keystone' effect. Alternatively, the board 112 can be raised and lowered by the person pulling upon a string, or an electric motor to drive the board up and down.

The raising and lowering of the board 112 also allows for the audience's perception of the positional depth upon the stage of an element of a projected image to be altered by varying the height of the element of the image upon the screen 110. It is envisaged that the board 112 may comprise a number of individual sections each of which may be raised and lowered individually in order to allow the perceived depth of an individual element of an image to be varied independently of other elements of the image.

A non-reflective mask 136 in the shape of a prop 138, in this example a rock, is placed upon the board 112. The prop 138 is placed upon the stage 109, typically behind the screen 110. The mask 136 is placed such that the board 112 is obscured in a region corresponding to where the prop 138 is located with respect to the screen 110. This arrangement of mask 136 and prop 138 results in an image, or part of the image, projected upon the screen 110 apparently disappearing as the image, or part of the image, passes over prop 138 and reappearing once the image, or part of the image has passed over the prop 138 as the mask 136 prevents light being reflected onto the region of the screen 110 corresponding to the location of the prop 138. The mask 136 can be variable in size and shape, for example by means of a sliding panel that is moved into location and varied in size according to the size of the prop 138. This also allows for the depth perception of props to be varied as their apparent effect upon variable depth image elements, as discussed hereinbefore, can be varied appropriately, for example a given size of rock will obscure proportionately more of a distant image than the same rock will of a near image.

A light source 140 is mounted upon the box frame 102 and illuminates the prop 138 in order to reduce the effect of any residual light reflected from the board 112 onto the prop.

Referring now to FIG. 2a, an alternative projection arrangement 200, suitable for use with the apparatus of FIGS. 1 and 2 with an additional truss, comprises the projector 106 depending from a truss 202 forward of the screen 110, an inclined mirror 204 of variable inclination depending from a second truss 206 forward of projector 110. The projector 106 projects an image on to the mirror 204 such that the image is projected on to the reflective board 112 and on to the screen 110. The mirror 204 is typically arranged to be perpendicular to the board 112, and in embodiments where the board 112 has a variable angle of inclination the mirror 204 will usually be arranged to track, synchronously, with any variation in the angle of inclination of the board 112.

It will be appreciated that the term mirror is used herein to describe any reflective surface that reflects substantially all, typically in excess of 50% preferably in excess of 80%, light impinging upon it.

Referring now to FIG. 3, a projection apparatus 300 is substantially similar to that of FIGS. 1 and 2 accordingly identical parts to those of FIGS. 1 and 2 are accorded similar reference numerals in the three hundred series.

A projection screen 306 resides in front of the screen 310 adjacent the lower front cross-piece truss 304b. The projec-

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tion screen 306 is typically a liquid crystal display (LCD) screen or a television screen. The projection screen 306 projects an image upwards onto the front surface of the screen 310. The use of a projection screen 306 removes the 'keystone' effect associated with conventional projectors.

A mask 336 can be formed upon the screen by use of a computer 340 to control the projection screen 306 to black out the appropriate part of the projection screen 306 electronically. This removes the need for a physical mask to be produced. The computer 340 can be used to switch off areas of the projection screen 306 which do not contain part of an image to be projected, this reduces the milky white hue associated with such areas when using conventional projectors. Also, the use of a computer 340 to control the projection screen 306, together with image sizing in relation to image movement allows an image to be readily scaled and positioned upon the projection screen 306 to enhance an audience's perception of depth and movement of a projected image using known image processing techniques. Alternatively, the projection screen 306, or sections of the projection screen 306, can be raised and lowered under the control of the computer 340 in order to enhance the audience's perception of depth of the projected image.

Referring now to FIG. 5, a box truss framework 500 comprises a square upper truss work 502 and leg trusses 504. In constructing the framework 500 the upper truss work 502 rests upon a number of jacks 506. First sections 508 of the leg trusses 504 that extend at right angles to the upper truss work 502 are added at the corners of the upper truss work 502. The height of the jacks 506 is increased to allow additional sections 510 of the leg trusses 504 to be added until the desired height of the box truss framework 500 is achieved.

A cross-piece truss 512 is fixed to two of the leg trusses 504 such that it horizontally spans the gap therebetween at a height close to, and typically slightly below, the level of a stage floor 514. The leg trusses 504 spanned by the cross-piece truss 512 constitute the rear legs of the framework 500 and are located adjacent the front of the stage floor 514.

A dust-free protective plastic sheet 515 is laid across the width of the stage floor 514 in front of the rear legs of the framework 500. A roll of screen film 518 is removed from a protective cylindrical casing 520 and is unwound across the width of the stage floor 514. The film 518 is placed upon the sheet 515 in order to prevent damage to the surface from dust particles or other sharp protrusions.

A lower edge 522 of the film 518 is placed between jaws 524a,b of a retention member 526, each jaw 524a,b having opposed openings therethrough spaced at approximately 0.5 m intervals. Bolts 528 are placed through the openings, and through the film 518, and secured in position using respective nuts. Ratchet straps 532 are attached to the retention member 526 adjacent alternate bolts 528, having a spacing of approximately 1 m, and are then attached to the cross-piece truss 512.

A second retention member 534 is attached to an upper edge 536 of the film 518 in a similar manner to how the retention member 526 is attached to the lower edge 522. Ratchet straps 538 are attached to the second retention member 534.

A rope 540 is tied to the second retention member 534 and is passed over the upper truss work 502 opposite the cross-piece truss 512. The film is raised into position using the rope 540 and the ratchet straps 538 are attached to the upper truss work 502. Both sets of ratchet straps 532, 538 are tightened individually until the screen film is tensioned such that the film 518 is flat and, ideally, free from wrinkles.

A projector 542 is depended from the upper truss work 502 and a pigmented reflective board 544 is placed between the

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screen 518 and the front edge of the box truss framework 500 such that light emitted by the projector 542 is reflected from the board 544 onto the screen 518. The screen 518 reflects at least part of the light from a front surface thereof away from the stage and into an auditorium to be viewed by and audience.

In order to prevent the audience observing the projection apparatus both side and front drapes 546 are used to screen the apparatus from the audience.

The invention claimed is:

1. An image projection apparatus, comprising:

a projector, a frame, a light source and an at least partially transparent screen;

the frame being arranged to retain the screen under tension, such that the tension of the screen can be varied at a plurality of positions along at least one edge of said screen such that the screen is substantially wrinkle free; the light source arranged to illuminate at least part of the apparatus;

the screen inclined at an angle with respect to a plane of emission of light from the projector and the screen having a front surface arranged such that light emitted from the projector is reflected therefrom; and

the projector being arranged to project an image such that light forming the image impinges upon the screen such that a virtual image is created from light reflected from the screen, the virtual image appearing to be located behind the screen, wherein the screen is foil and the frame comprises first and second retention members each arranged to sandwich an edge region of the screen therebetween, the first and second retention members comprising respective openings therethrough arranged to collocate with respective openings in the screen, wherein the openings are arranged to receive a fixing means so as to clamp the screen between the first and second retention members, and wherein at least one of the first and second retention members is attached to tensioning straps.

2. The apparatus of claim 1, wherein the screen is attached to the frame at the screen's upper edge, lower edge, or both.

3. The apparatus of claim 1, wherein the tensioning straps are attached to a truss arrangement or a fixed mounting point located in a permanent structure such as a wall, floor or ceiling and are adjustable such that the tension of the screen within the truss arrangement can be varied about the periphery of the screen.

4. The apparatus of claim 3, wherein the retention members are substantially parallel to truss members comprising the truss arrangements.

5. The apparatus of claim 1, wherein the screen is inclined at approximately 45° to the plane of emission of light from the projector.

6. The apparatus of claim 1, wherein the light source is located to the rear of the screen, along a top edge of the frame, along either side of a stage, or some combination thereof.

7. An image projection apparatus, comprising:

a projector, a frame or fixed mounting points, and an at least partially transparent screen;

the frame or fixed mounting points being arranged to retain the screen under tension, such that the screen is inclined at an angle with respect to a plane of emission of light from the projector;

the screen having a front surface arranged such that light emitted from the projector is reflected therefrom; and the projector being arranged to project an image such that light forming the image impinges upon the screen such that a virtual image is created from light reflected from

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the screen, the virtual image appearing to be located behind the screen, and wherein the frame comprises first and second retention members arranged to sandwich an edge region of the screen therebetween, and wherein a plurality of fixing means pass through the first retention member and through the screen and clamp the screen between the first and second retention members, and optionally locking means is provided adapted to lock the fixing means;

wherein the screen is a polymeric transparent foil that is held taught and substantially wrinkle-free by the retention members, the retention members having generally parallel faces which clamp an edge region of the foil between them, and wherein individually variable foil tensioning mechanisms are provided at spaced apart locations around the periphery of the foil to enable the foil to have tensioning force independently varied at the said spaced apart locations around the periphery of the foil, and wherein the first and second retention members are connected to one or more flexible tensioning means, which extend from the frame or fixed mounting points to the foil-gripping members, the foil, flexible tensioning means and the frame or fixed mounting points lying in a common inclined plane, with the tension on the foil being applied in the plane of the flexible tensioning means, and the foil, the tensioning mechanisms comprising straps and ratchet strap tensioners, or straps and a friction-locking buckle arrangement.

8. The apparatus according to claim 7, wherein respective locking means are provided for the fixing means.

9. The apparatus according to claim 8, wherein the locking means is provided in the form of nuts, to lock the fixing means in position, the fixing means extending through the retention members and the screen.

10. The apparatus according to claim 7, wherein the first and second retention members comprise a plurality of respective openings, with the fixing means extending through the openings.

11. The apparatus according to claim 7, wherein an abrasive surface is provided on at least one of the retention members to increase the grip between the retention member and the screen, thereby reducing the likelihood of the screen slipping when held by the retention member.

12. The apparatus according to claim 11, wherein the abrasive surface comprises sandpaper.

13. The apparatus according to claim 7, wherein the screen is a foil.

14. An image projection apparatus, comprising:

a projector, a frame or fixed mounting points, and an at least partially transparent screen;

the frame or fixed mounting points being arranged to retain the screen under tension, such that the screen is inclined at an angle with respect to a plane of emission of light from the projector;

the screen having a front surface arranged such that light emitted from the projector is reflected therefrom; and the projector being arranged to project an image such that light forming the image impinges upon the screen such that a virtual image is created from light reflected from the screen, the virtual image appearing to be located behind the screen, and wherein the frame comprises first and second retention members arranged to sandwich an edge region of the screen therebetween, the first and second retention members being connected to one or more flexible tensioning means, which extend from the frame or fixed mounting points, the foil, flexible tensioning means and the frame or fixed mounting points lying

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in a common inclined plane, with the tension on the foil being applied in the plane of the flexible tensioning means and the foil, and wherein a plurality of fixing means pass through the first retention member and through the screen and clamp the screen between the first and second retention members, optionally locking means is provided adapted to lock the fixing means, and the first and second retention members comprise respective openings therethrough arranged to collocate with openings in respective jaws of clamping members attached to tensioning straps.

15. The apparatus according to claim 14, wherein the screen comprises a partially reflective layer upon the front surface and is inclined at approximately 45° to the plane of emission of light from the projector.

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16. The apparatus according to claim 14, wherein the screen is attached to the frame at the screen's upper edge, lower edge, or both.

17. The apparatus according to claim 14, wherein the tensioning straps are attached to a truss arrangement or a fixed mounting point located in a permanent structure such as a wall, floor or ceiling and are adjustable such that the tension of the screen within the truss arrangement can be varied about the periphery of the screen.

18. The apparatus according to claim 17, wherein the retention members are substantially parallel to truss members comprising the truss arrangement.

* * * * *

EXHIBIT C



US008328361B2

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O'Connell et al.

(10) **Patent No.:** **US 8,328,361 B2**
(45) **Date of Patent:** **Dec. 11, 2012**

(54) **PROJECTION APPARATUS AND METHOD
FOR PEPPER'S GHOST ILLUSION**

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(51) **Int. Cl.**

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G03B 21/56 (2006.01)

G02B 27/22 (2006.01)

A63G 31/00 (2006.01)

A63J 5/00 (2006.01)

(52) **U.S. Cl.** **353/10; 359/449; 359/478; 472/63**

(58) **Field of Classification Search** **353/10,**
353/74, 79, 119, 122, 28; 359/443, 447,
359/449, 478, 479, 630; 472/58, 61, 63

See application file for complete search history.

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Primary Examiner — William C Dowling

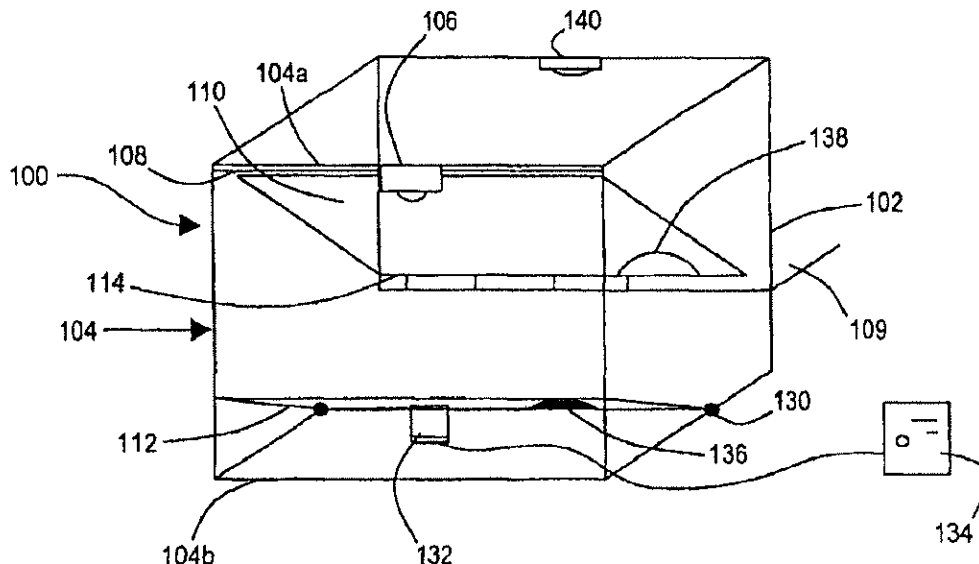
Assistant Examiner — Ryan Howard

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Horstemeyer & Risley LLP.

(57) **ABSTRACT**

An image projection apparatus includes a projector, a frame, and a partially transparent screen. The frame retains the screen under tension, such that the screen is inclined at an angle with respect to a plane of emission of light from the projector. The screen has a front surface arranged such that light emitted from the projector is reflected therefrom. The projector projects an image such that light forming the image impinges upon the screen such that a virtual image is created from light reflected from the screen, the virtual image appearing to be located behind the screen.

20 Claims, 4 Drawing Sheets



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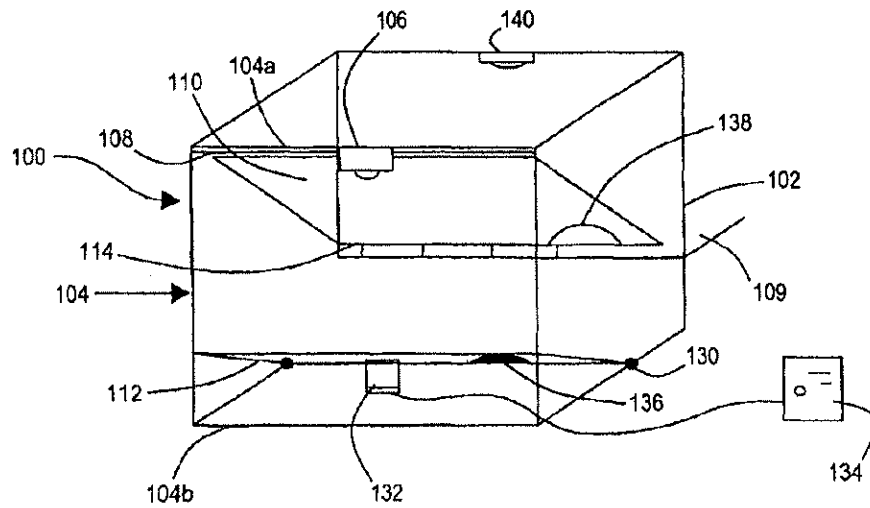


Fig. 1

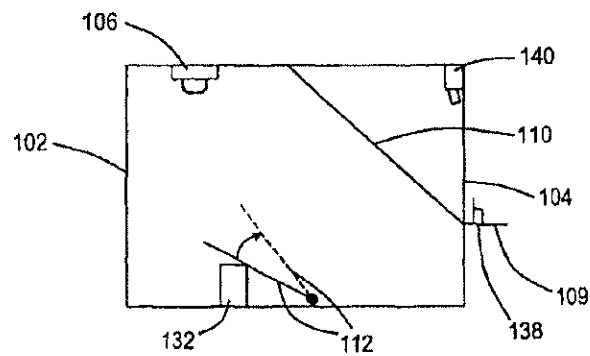


Fig. 2

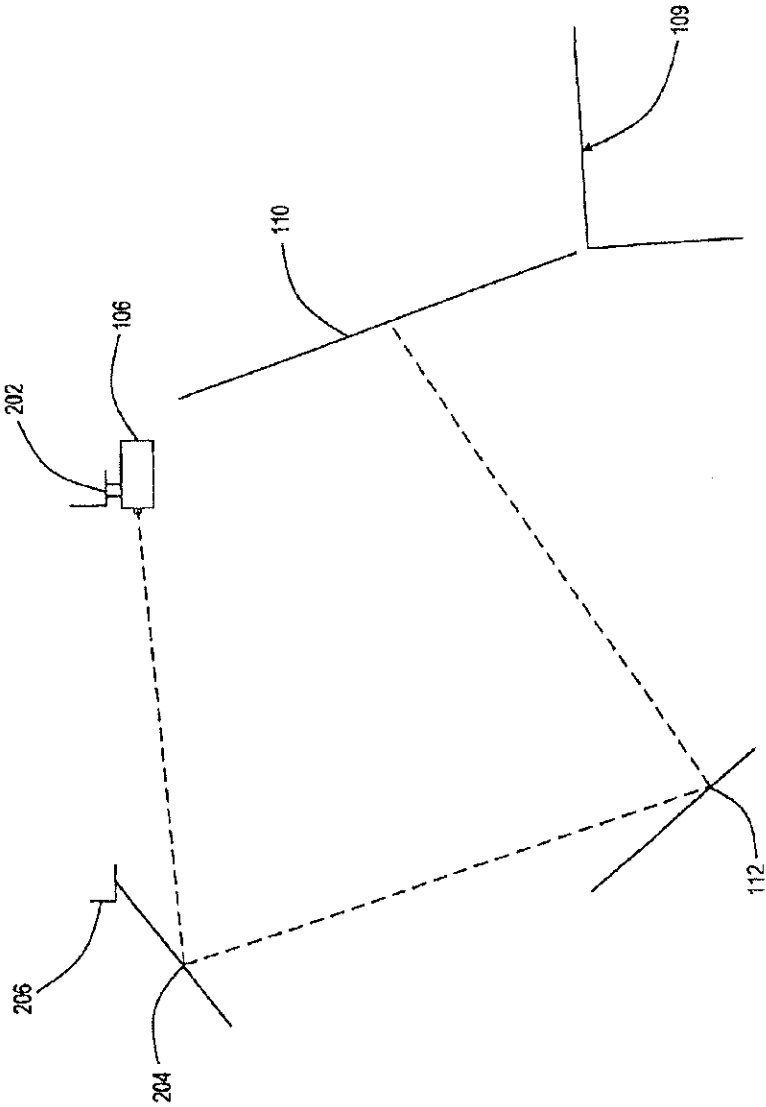


Fig. 2a

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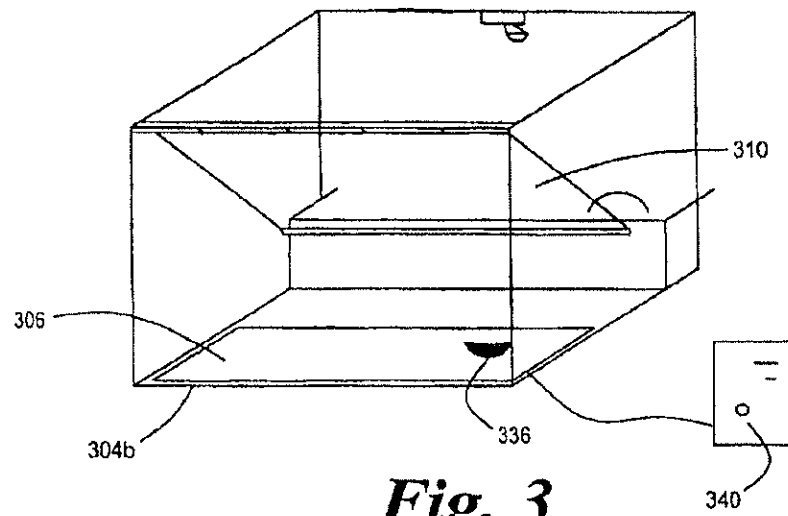


Fig. 3

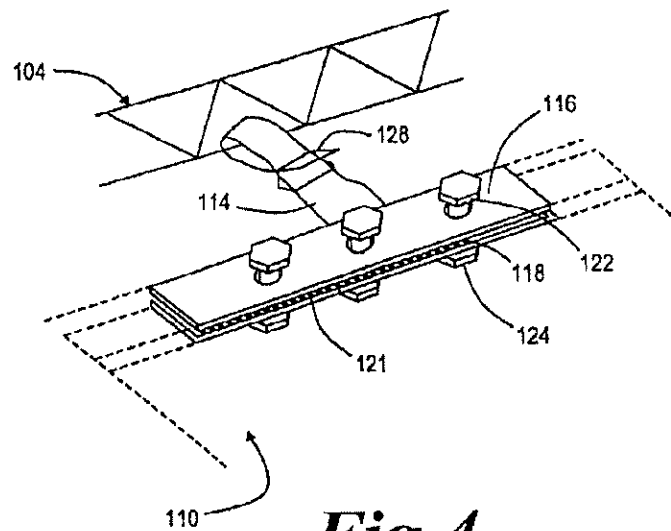


Fig. 4

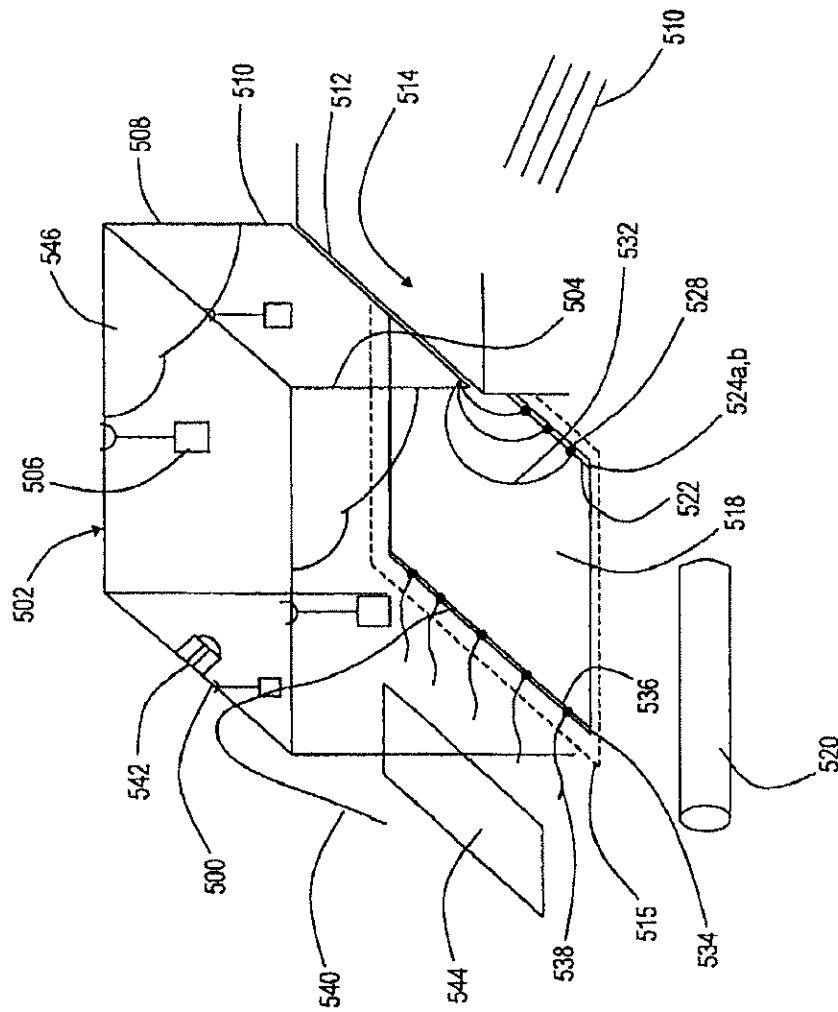


Fig. 5

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PROJECTION APPARATUS AND METHOD FOR PEPPER'S GHOST ILLUSION

This invention relates to a projection apparatus and method. More particularly, but not exclusively, it relates to a projection apparatus arranged to project an image of an object upon an inclined, partially reflective, screen so as to give a false perception of depth and a method for constructing such an apparatus.

BACKGROUND OF THE INVENTION

The projection of an image upon a partially reflective screen such that is observable by a viewer positioned in front of the screen is known, the so-called "Peppers ghost" arrangement that is known from fairground shows.

This has been applied to publicity and promotional displays where a presenter resides behind an inclined, partially reflective screen, typically a tensioned foil, onto which an image of, for example, a motor vehicle is projected, via at least one reflective surface, see for example EP 0799436. The location of the presenter behind the projected image has a number of inherent advantages over systems where the presenter stands in front of a screen, not least of which is that the presenter does not obscure the projected image when walking across the projected image. Additionally, the use of an inclined screen results in a viewer of the image perceiving the image as having depth rather than merely being a two dimensional image, for example where a motor vehicle is seen to rotate upon a turntable.

However, current image projection apparatus' do have a number of problems associated with them, for example, mounting of the foil can prove difficult which in turn leads to uneven tensioning of the foil and wrinkles upon the foil, that impair the viewed quality of the image projected onto the foil. Also, in mounting the foil the foil must be laid out upon a clean dust free piece of cloth or plastic sheet, which is larger than the foil, in order to prevent particles adhering to the foil, such particles can scratch the surface of the foil and impair the viewed quality of the projected image or act as scattering centres from which projected light is incoherently scattered, thereby detracting from the viewed quality of the image as this scattered light does not contribute to the viewed image.

Also, as the illusion of peppers ghost relies on the reflected image formed by light contrasting with its immediate surroundings and background. The stronger the reflected image, the more solid that reflected image looks, the more vibrant the colours will be, and the more visible the reflected image is to an audience. In circumstances where the presenter may be unable to control high levels of ambient light forward of the foil, e.g. from an auditorium at a trade show, the high level of ambient light results in significant levels of reflection of the ambient light from the screen detracting from the strength of the reflected image over the background. In these circumstances a bright projector (8000 lumens+) is desirable. However, the use of a bright projector results in unwanted light hitting the projection surface and reflecting through the foil to create a milky hue upon the stage and around the area where the reflected image appears.

Another problem with current image projection apparatus is that projectors used with such apparatus are very powerful, typically 8,000 to 27,000 lumens and consequently project a significant amount of light into areas of an image where there is no object within the image. This is an inherent feature of projectors and results in low contrast ratios which leads to a milky hue spread over the part of the film where the projector is creating an image when the projector is switched on. The

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milky hue is clearly undesirable as it detracts from the viewer's perception that there is no screen present.

The level of the milky hue relative to the brightness of the image is, at least partially, determined by the level of contrast ratio offered in the projector. The higher the contrast ratio, then the brighter the image can be relative to the brightness level of the milky hue. Even projectors with contrast ratios as high as 3000:1 still emit a milky light hue when used in a "Pepper's Ghost" arrangement.

A further problem associated with some projectors is the "keystone" effect, in which distorted, typically elongated, images (up and down) occur due to angled projection. This is of particular relevance where depth perception is of importance. The solution employed in modern, expensive projectors is to employ digital correction of keystone distortions. However, older, less-expensive or even some specialist High Definition projectors do not employ such digital keystone correction and are therefore difficult to configure for use with current image projection apparatus. High definition (HD) projectors do not offer keystone adjustment because when keystone correction is attempted in conjunction with the increased number of pixels about an image's edge causes the pixels about the edge of the image to appear 'crunched'. Additionally, when processing moving images HD projectors compromise projector processing speed. When the processing power is used to carry out both keystone correction and motion processing the image is seen to jerk during movements, an effect known as "chokking". In general, it can be said that the use of electronic keystone correction to alter a video image will result in the degradation of picture quality compared to an image which is not subject to such a process.

Additionally, current systems do not allow for the projected image to apparently disappear and re-appear from behind a solid 3D object placed upon the stage, as the screen lies in front of the presenter and closest to the viewing audience.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a image projection apparatus comprising a projector, a frame, and an at least partially transparent screen:

the frame being arranged to retain the screen under tension, such that the screen is inclined at an angle with respect to a plane of emission of light from the projector;

the screen having a front surface arranged such that light emitted from the projector is reflected therefrom; and

the projector being arranged to project an image such that light forming the image impinges upon the screen such that a virtual image is created from light reflected from the screen, the virtual image appearing to be located behind the screen.

Such an apparatus is advantageous over present systems in that the screen need not be coated with an expensive, partially reflective coating, an angular dependence of reflectivity of transparent dielectric materials can be used to bring about partial reflectance of the projected image. Thus, this apparatus simplifies the manufacture of such systems and also reduces their production costs. Additionally, the use of a frame frees the screen from having to be fixed directly to a ceiling, or a floor, and therefore increases the utility of apparatus over the prior art systems.

The screen may be a foil. The foil may be rolled about a cylinder when not in use. The screen may be inclined at approximately 45° to the plane of emission of light from the projector. The screen may comprise a partially reflective layer upon the front surface.

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The use of a foil screen reduces the weight of the apparatus, this allows ready transportation of the apparatus between sites. Rolling the foil onto a cylinder when not in use serves to protect the foil from damage during transportation and also allows ready transportation of the apparatus between sites. The use of a partially reflective screen can increase the degree of light reflected from the screen and can increase the audience perceived strength of the virtual image.

The screen may be attached to the frame at the screen's upper and/or lower edges. The frame may comprise first and second retention members arranged to sandwich an edge region of the screen therebetween. At least one of the first and second retention members may comprise an abrasive coating, typically sandpaper, arranged to contact the screen. The first and second retention members may comprise respective openings therethrough that may be arranged to collocate with openings in respective jaws of clamping members attached to tensioning straps, the openings may be arranged to receive a fixing means so as to clamp the screen between the first and second retention members. The tensioning straps may be attached to a truss arrangement and may be adjustable such that the tension of the screen within the truss arrangement can be varied about the periphery of the screen. Preferably, the retention members are substantially parallel to truss members comprising the truss arrangement.

The use of a variable tensioning arrangement allows wrinkles upon the screen to be minimised, and ideally eradicated to present a smooth surface for upon which the image can be projected. An abrasive surface upon at least one of the retention members increases the grip between the retention member and the screen thereby reducing the likelihood of the screen slipping when held by the retention member.

The apparatus may comprise a pigmented reflective member in an optical pathway between the projector and the screen. The pigmented member may reflect only part of the visible spectrum of light, typically the pigmented member will appear grey or white to a viewer.

It has been found that the use of a grey reflective member in the optical pathway between the projector and the screen reduces the outline of the reflective member upon the screen compared to when a white reflective member is used, and also reduces the level of the milky white hue associated with the projector emitting light where there is no image of an object to be projected.

The pigmented reflective member may be inclined at an angle with respect to the plane of emission of light from the projector. The angle of inclination of the member with respect to the plane of emission of light from the projector may be variable. The member may comprise a plurality of sections each of which may have an independently variable angle of inclination with respect to the plane of emission of light from the projector.

The inclination of the reflective member can compensate, at least partially and in some instances completely, for key-stone effect. The variation of the angle of inclination or distance of the reflective member allows for a variation of the apparent depth and/or position of an object when projected upon the screen. This is because the virtual image appears as far behind the screen as the real image is in front of the screen.

There may be a reflective device, typically a mirror, arranged to direct light projected from the projector on to the reflective member. Typically, the reflective device is mounted upon an upper part of the framework. The reflective member may be parallel, or substantially parallel, to the reflective device. In some embodiments the projector may be mounted upon an upper truss of the framework and may be aligned with

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the horizontal, typically light projected from the projector is directed on to the reflective device.

Such an arrangement compliments the keystone correction achievable by the inclination of the screen and the reflective member and is particularly useful where an HD projector is used in order to compensate for the keystone effect without the use of the projector's processing power.

The reflective member may comprise a mask corresponding to the apparent location of a prop in the screen to an audience. Typically, the mask will absorb light over at least a fraction of the visible spectrum and preferably the mask will be black. The mask may be arranged to produce an area upon the screen upon which the image is not projected. The mask may vary in extent and shape, for example by the use of a sliding element that is moved in and out of position upon the reflective member.

The mask can be used to make the illusion of an article disappearing and reappearing behind a prop that is placed upon a stage, either behind or in front of the screen.

The apparatus may comprise a light source arranged to selectively illuminate an area of stage comprising the prop. The light source may be a white light source

Lighting the prop causes the prop to become more visible and better defined against the dark, typically black, background. This enhances the three dimensional effect of the projected image interacting with the prop. Also directing bright light upon the prop serves to reduce the contrast ratio of the projected image upon the prop, which typically remains slightly visible even when a mask is used in the prop's shadow upon the reflective member, thus enhancing the illusion of the projected image disappearing behind the prop.

The apparatus may comprise a light source arranged to illuminate at least part of a stage. The light source may be located to the rear of the screen, typically along a top edge of the frame and/or along either side of the stage. The apparatus may comprise a plurality of light sources. The apparatus may comprise a lighting desk equipped with faders arranged to control the level of each light source, or selection means arranged to selectively control the supply of power to each light source.

Such a light source is used in order that the colour and light levels of the area immediately surrounding the peppers ghost image, the stage background, can most closely match the colour of the projection surface background, excluding the area on both which is carrying the image. This, reduces the milky hue perceived by the audience. The use of a plurality of light sources increases the uniformity of lighting of the stage, in order to produce a similar effect to the way light emitted from a projector hits the projection screen. By controlling each light source separately the lighting levels upon the stage can be controlled to closely match the levels of light as dictated by the show performance, or the levels of unwanted light hitting the projection surface of the screen.

The projector may comprise a standard projector, for example a JVC ML4000, or a Barco G5. Alternatively, the projector may comprise an LCD, or a television display. The display may comprise at least one element arranged to be non-emitting in response to control from a processor. The at least one element may form a mask arranged to produce an area upon the screen upon which the image is not projected. The mask may correspond to the shape and location of a prop upon stage. The prop may be three dimensional.

According to a second aspect of the present invention there is provided a method of providing a projection apparatus comprising the steps of:

- (i) resting a frame upon a number of elevation means;
- (ii) attaching leg sections to the frame;

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- (iii) increasing the height of the elevation means;
- (iv) adding further leg sections;
- (v) attaching a lower edge of a screen to a lower rear piece of the frame;
- (vi) raising an upper edge of the screen to adjacent an upper front section of the frame; and
- (vii) attaching the upper edge of the screen to the upper front section of the frame.

The method may comprise providing the elevation means in the form of a jack.

The method may comprise providing the screen in the form of a film. The method may comprise removing a roll of screen film from a protective cylindrical casing. The method may comprise laying the screen upon a dust-free protective sheet.

The method may comprise placing the lower edge of the screen between jaws of a first retention member and may further comprise securing the screen in position using a fixing means passing through the retention member and the screen and a locking means arranged to lock the fixing means being arranged to secure the locking means in position. The method may comprise providing the fixing means in the form of a bolt and the locking means in the form of a nut.

The method may comprise attaching tensioning means to the retention member adjacent at least some of the fixing means.

The method may comprise attaching the tensioning means to the lower rear piece of the frame. The method may comprise attaching a second retention member to an upper edge of the film screen, typically in the same manner as the first retention member is attached to the lower edge. The method may comprise attaching tensioning means to the second retention member. The method may comprise providing the tensioning members in the form of ratchet straps.

The method may comprise attaching a rope to the second retention member and passing the rope over the upper frame and using the rope in step (vii) to raise the screen.

The method may include tensioning each of the tensioning means such that the screen is flat and substantially wrinkle free.

The method may include depending a projector from the upper frame.

The method may include placing a pigmented reflective board between the screen and a front edge of the frame. The method may comprise reflecting light emitted by the projector from the board onto the screen.

The method may comprise forming the frame from a truss work.

According to a third aspect of the present invention there is provided a projection apparatus constructed according to the second aspect of the present invention.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

The invention will now be described, by way of example only, with reference to the accompanying drawings, in which:

FIG. 1 is a schematic representation of a first embodiment of a projection apparatus according to at least an aspect of the present invention;

FIG. 2 is a side view of a the projection apparatus of FIG. 1 showing a pigmented reflective member in first and second positions;

FIG. 2a is a schematic representation of an alternative projection arrangement, suitable for use with the apparatus of FIGS. 1 and 2;

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FIG. 3 is a schematic representation of a second embodiment of a projection apparatus according to at least an aspect of the present invention;

FIG. 4 is a perspective view of a screen clamping arrangement of FIGS. 1, 2 and 3; and

FIG. 5 is a schematic view of a projection apparatus being constructed according to the second aspect of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to FIGS. 1, 2 and 4, a projection apparatus 100 comprises a box frame 102 formed of trusses 104, a projector 106, a support frame 108, a screen 110 held within the support frame 108 and a grey pigmented reflective board 112.

The projector 106 depends from a front upper cross-piece truss 104a of the box frame 102. The board 112 lies below the projector 106 at the base of the box frame 102. The screen 110, is inclined at approximately 45° to the horizontal and the front edge of the screen 110 is proximate the front upper cross-piece truss 104a of the box frame 102 and the rear edge of the screen is proximate a stage 109 that lies to the rear of the box frame 102.

The screen 110 is typically a polymeric foil, which can have a partially reflective coating upon a front face of the foil. The screen 110 is retained within the box frame 102 by means of tensioning straps 114 attached to the box frame 102, at the top and bottom edges of the screen 110. At a free end of each of the tensioning straps 114 there is pair of clamp jaws 116 which have respective openings 118, 120 passing there-through. The faces of the jaws 116 are optionally coated with an abrasive 121, such as sandpaper, in order to enhance the grip of the jaws 116 upon the screen 110.

Edges of the screen 110 are placed between the jaws 116 and a bolt 122 is placed through the openings 118, 120 and passes through the screen 110. A nut 124 is threaded onto the bolt 122 and tightened to hold the screen 110 between the jaws 116. The tensioning straps 114 pass through the trusses 104 and are tightened using a friction locking buckle arrangement 128.

Each of the tensioning straps 114 can be tightened or loosened individually so as to allow an even tension to be applied over the whole surface of the screen 110 thereby reducing, and ideally eliminating, the formation of wrinkles upon the screen 110 which reduce the quality of an image projected upon the screen 110.

The reflective board 112 lies below the projector 106 adjacent to a lower front cross-piece truss 104b of the box frame 102. The projector 106 is directed such that light emitted by the projector 106 strikes the reflective board 112. The board 112 is inclined so that the light emitted by the projector 106 is reflected upwards from the board 112 onto the screen 110. The use of a grey, or otherwise coloured board 112 reduces the milky hue associated with light from the projector where there is no image to be projected.

A fraction of the projected light striking the screen 110 is reflected from the front surface of the screen 110 where is can be viewed by an audience. A presenter upon the stage 109 behind the screen 110 can also be viewed by the audience but does not interfere with the viewing of the image by the audience.

The board 112 is connected to a hinge arrangement 130 along a rear edge thereof. The hinge arrangement 130 allows the board 112 to be raised and lowered, typically by a hydraulic ramp 132 controlled by a computer 134, in order to compensate for the 'keystone' effect. Alternatively, the board 112

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can be raised and lowered by the person pulling upon a string, or an electric motor to drive the board up and down.

The raising and lowering of the board 112 also allows for the audience's perception of the positional depth upon the stage of an element of a projected image to be altered by varying the height of the element of the image upon the screen 110. It is envisaged that the board 112 may comprise a number of individual sections each of which may be raised and lowered individually in order to allow the perceived depth of an individual element of an image to be varied independently of other elements of the image.

A non-reflective mask 136 in the shape of a prop 138, in this example a rock, is placed upon the board 112. The prop 138 is placed upon the stage 109, typically behind the screen 110. The mask 136 is placed such that the board 112 is obscured in a region corresponding to where the prop 138 is located with respect to the screen 110. This arrangement of mask 136 and prop 138 results in an image, or part of the image, projected upon the screen 110 apparently disappearing as the image, or part of the image, passes over prop 138 and reappearing once the image, or part, of the image has passed over the prop 138 as the mask 136 prevents light being reflected onto the region of the screen 110 corresponding to the location of the prop 138. The mask 136 can be variable in size and shape, for example by means of a sliding panel that is moved into location and varied in size according to the size of the prop 138. This also allows for the depth perception of props to be varied as their apparent effect upon variable depth image elements, as discussed hereinbefore, can be varied appropriately, for example a given size of rock will obscure proportionately more of a distant image than the same rock will of a near image.

A light source 140 is mounted upon the box frame 102 and illuminates the prop 138 in order to reduce the effect of any residual light reflected from the board 112 onto the prop.

Referring now to FIG. 2a, an alternative projection arrangement 200, suitable for use with the apparatus of FIGS. 1 and 2 with an additional truss, comprises the projector 106 depending from a truss 202 forward of the screen 110, an inclined mirror 204 of variable inclination depending from a second truss 206 forward of projector 110. The projector 106 projects an image on to the mirror 204 such that the image is projected on to the reflective board 112 and on to the screen 110. The mirror 204 is typically arranged to be perpendicular to the board 112, and in embodiments where the board 112 has a variable angle of inclination the mirror 204 will usually be arranged to track, synchronously, with any variation in the angle of inclination of the board 112.

It will be appreciated that the term mirror is used herein to describe any reflective surface that reflects substantially all, typically in excess of 50% preferably in excess of 80%, light impinging upon it.

Referring now to FIG. 3, a projection apparatus 300 is substantially similar to that of FIGS. 1 and 2 accordingly identical parts to those of FIGS. 1 and 2 are accorded similar reference numerals in the three hundred series.

A projection screen 306 resides in front of the screen 310 adjacent the lower front cross-piece truss 304b. The projection screen 306 is typically a liquid crystal display (LCD) screen or a television screen. The projection screen 306 projects an image upwards onto the front surface of the screen 310. The use of a projection screen 306 removes the 'key-stone' effect associated with conventional projectors.

A mask 336 can be formed upon the screen by use of a computer 340 to control the projection screen 306 to black out the appropriate part of the projection screen 306 electronically. This removes the need for a physical mask to be pro-

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duced. The computer 340 can be used to switch of areas of the projection screen 306 which do not contain part of an image to be projected, this reduces the milky white hue associated with such areas when using conventional projectors. Also, the use of a computer 340 to control the projection screen 306, together with image sizing in relation to image movement allows an image to be readily scaled and positioned upon the projection screen 306 to enhance an audience's perception of depth and movement of a projected image using known image processing techniques. Alternatively, the projection screen 306, or sections of the projection screen 306, can be raised and lowered under the control of the computer 340 in order to enhance the audience's perception of depth of the projected image.

Referring now to FIG. 5, a box truss framework 500 comprises a square upper truss work 502 and leg trusses 504. In constructing the framework 500 the upper truss work 502 rests upon a number of jacks 506. First sections 508 of the leg trusses 504 that extend at right angles to the upper truss work 502 are added at the corners of the upper truss work 502. The height of the jacks 506 is increased to allow additional sections 510 of the leg trusses 504 to be added until the desired height of the box truss framework 500 is achieved.

A cross-piece truss 512 is fixed to two of the leg trusses 504 such that it horizontally spans the gap therebetween at a height close to, and typically slightly below, the level of a stage floor 514. The leg trusses 504 spanned by the cross-piece truss 512 constitute the rear legs of the framework 500 and are located adjacent the front of the stage floor 514.

A dust-free protective plastic sheet 515 is laid across the width of the stage floor 514 in front of the rear legs of the framework 500. A roll of screen film 518 is removed from a protective cylindrical casing 520 and is unwound across the width of the stage floor 514. The film 518 is placed upon the sheet 515 in order to prevent damage to the surface from dust particles or other sharp protrusions.

A lower edge 522 of the film 518 is placed between jaws 524a,b of a retention member 526, each jaw 524a,b having opposed openings therethrough spaced at approximately 0.5 m intervals. Bolts 528 are placed through the openings, and through the film 518, and secured in position using respective nuts. Ratchet straps 532 are attached to the retention member 526 adjacent alternate bolts 528, having a spacing of approximately 1m, and are then attached to the cross-piece truss 512.

A second retention member 534 is attached to an upper edge 536 of the film 518 in a similar manner to how the retention member 526 is attached to the lower edge 522. Ratchet straps 538 are attached to the second retention member 534.

A rope 540 is tied to the second retention member 534 and is passed over the upper truss work 502 opposite the cross-piece truss 512. The film raised into position using the rope 540 and the ratchet straps 538 are attached to the upper truss work 502. Both sets of ratchet straps 532, 538 are tightened individually until the screen film is tensioned such that the film 518 is flat and, ideally, free from wrinkles.

A projector 542 is depended from the upper truss work 502 and a pigmented reflective board 544 is placed between the screen 518 and the front edge of the box truss framework 500 such that light emitted by the projector 542 is reflected from the board 544 onto the screen 518. The screen 518 reflects at least part of the light from a front surface thereof away from the stage and into an auditorium to be viewed by and audience.

In order to prevent the audience observing the projection apparatus both side and front drapes 546 are used to screen the apparatus from the audience.

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The invention claimed is:

1. An image display apparatus, comprising:

an image source, a frame, a light source and an at least partially transparent screen;

the frame being arranged to retain the screen under tension, such that the tension of the screen can be independently varied at a plurality of positions along at least one edge of said screen;

the light source arranged to illuminate at least part of the apparatus;

the screen inclined at an angle with respect to a plane of emission of light from the image source and the screen having a front surface arranged such that light emitted from the image source is reflected therefrom; and

the image source being arranged such that light forming the image impinges upon the screen such that a virtual image is created from light reflected from the screen, the virtual image appearing to be located behind the screen,

wherein the screen is polymeric foil and the frame comprises first and second retention members having opposing faces arranged in parallel to sandwich an edge region of the screen therebetween, and at least one of the faces of the first and second retention members comprises an abrasive coating arranged to contact the screen, and

wherein the first and second retention members are connected to one or more flexible tensioning means, which extend from the frame, the flexible tensioning means comprising tensioning straps and corresponding friction locking buckle arrangements for tightening the tensioning straps;

the foil, flexible tensioning means and the frame lying in a common inclined plane, with the faces of the first and second retention members being oriented parallel to the common inclined plane and the tension on the foil being applied in the common inclined plane.

2. The apparatus according to claim 1 wherein the abrasive coating is sandpaper.

3. The apparatus according to claim 1 wherein the first and second retention members comprise respective openings therethrough arranged to collocate with respective openings in the screen wherein the openings are arranged to receive a fixing means so as to clamp the screen between the first and second retention members.

4. The apparatus according to claim 1 wherein the frame is arranged to retain the screen under tension such that the tension of the screen can be varied at a plurality of positions along at least one edge of the screen such that the screen is substantially wrinkle free.

5. The apparatus according to claim 1 further comprising a pigmented reflective member provided in an optical pathway between the image source and the screen and being operative to reflect only light from part of the visible spectrum.

6. The apparatus according to claim 5 wherein the pigmented reflective member appears grey to a viewer.

7. The apparatus according to claim 1 further comprising a second light source arranged to illuminate at least part of a stage lying behind the screen.

8. The apparatus of claim 1, wherein both of the faces of the first and second retention members comprise an abrasive coating.

9. The apparatus according to claim 1 wherein the image source comprises one of a projector, an LCD, or a television display.

10. An image display apparatus, comprising:

an image source, a frame, tensioning straps and corresponding friction locking buckle arrangements for tight-

10

ening the tensioning straps, a light source and an at least partially transparent screen;

the frame being arranged to retain the screen under tension, such that the tension of the screen can be independently varied at a plurality of positions along at least one edge of said screen;

the light source arranged to illuminate at least part of the apparatus;

the screen inclined at an angle with respect to a plane of emission of light from the image source and the screen having a front surface arranged such that light emitted from the image source is reflected therefrom; and

the image source being arranged such that light forming the image impinges upon the screen such that a virtual image is created from light reflected from the screen, the virtual image appearing to be located behind the screen,

wherein the screen is polymeric foil and the frame comprises first and second retention members having opposing faces arranged in parallel to sandwich an edge region of the screen therebetween, and at least one of the faces of the first and second retention members comprises an abrasive coating arranged to contact the screen, and

wherein the foil and the frame reside in a common inclined plane, with the faces of the first and second retention members being oriented parallel to the common inclined plane, the retention members being under tension, with the tension on the retention members and the foil being applied by the tensioning straps in the common inclined plane.

11. The apparatus of claim 10, wherein the first and second retention members are connected to one or more tensioning means, which extend from the frame.

12. The apparatus of claim 11, wherein the tensioning means are flexible tensioning means.

13. The apparatus according to claim 10, wherein the abrasive coating is sandpaper.

14. The apparatus according to claim 10, wherein the first and second retention members comprise respective openings therethrough arranged to collocate with respective openings in the screen wherein the openings are arranged to receive a fixing means so as to clamp the screen between the first and second retention members.

15. The apparatus according to claim 10, wherein the frame is arranged to retain the screen under tension such that the tension of the screen can be varied at a plurality of positions along at least one edge of the screen such that the screen is substantially wrinkle free.

16. The apparatus according to claim 10, further comprising a pigmented reflective member provided in an optical pathway between the image source and the screen and being operative to reflect only light from part of the visible spectrum.

17. The apparatus according to claim 16, wherein the pigmented reflective member appears grey to a viewer.

18. The apparatus according to claim 10, wherein the image source comprises one of a projector, an LCD, or a television display.

19. The apparatus according to claim 10, further comprising a second light source arranged to illuminate at least part of a stage lying behind the screen.

20. The apparatus of claim 10, wherein both of the faces of the first and second retention members comprise an abrasive coating.

* * * * *

EXHIBIT D

Pulse Entertainment Corporation*The Digital Celebrity Company.***KEY DATA****Industry:** Entertainment & Media - \$479B annually**Specialization:** High-impact applications of computer-generated digital humans**Customers:** General audiences, major & mini studios, networks, ad agencies, Fortune 500 companies**Funding Plan:** \$15MM preferred stock equity funding; further information and terms available to accredited investors**Location:** West Palm Beach, Florida

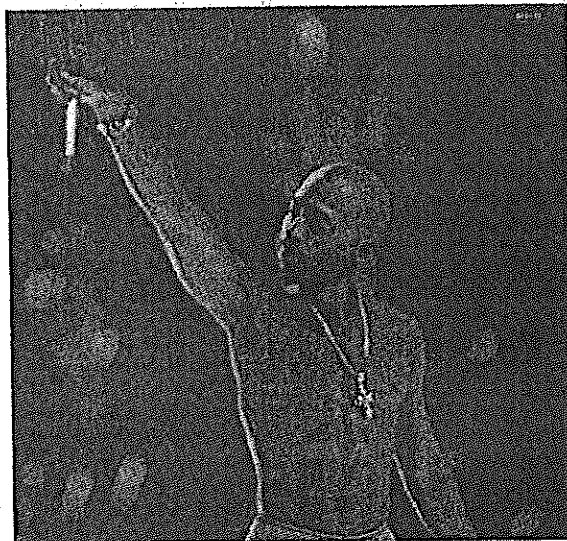
(\$000)	Year 1	Year 2	Year 3	Year 4	Year 5
Total Rev	\$7,916	\$31,081	\$67,096	\$109,670	\$161,948
Direct Exp	\$4,517	\$15,343	\$27,930	\$42,081	\$58,639
EBITDA	\$1,587	\$12,953	\$35,225	\$61,985	\$94,725

Introduction – Pulse Entertainment Corporation (“Pulse or the Company”) is a creatively driven, digital production company, focusing on virtual performances. Pulse produces specialized, high-impact applications of computer-generated celebrity and world figure likenesses in virtual live and holographic concerts, advertising, branded content, family-focused animation feature films, live-action feature films and education. The Company’s goal is to be the world’s leading developer and producer of computer generated human likeness. Today, the obvious applications of digital humans are in high demand in the entertainment sector. Tomorrow, digital humans will drive globally relevant – and far more lucrative – uses in surgical simulation, military simulation and telecommunications.

The Marketplace - The U.S. entertainment and media market generated revenues of \$479.23 billion in 2012. According to business editor Paul Bond of “The Hollywood Reporter,” revenues are expected to grow to more than \$632.09 billion, and \$2.152 trillion worldwide, by 2017. Pulse is set to produce digital media product that will penetrate every sector of this industry, and will be consumed by global audiences on the growing variety of screens and stages available today – from theaters and television, tablets and phones, to stages and dynamic live performance venues around the world. Pulse intends to further develop a new, globally relevant virtual performance industry that has recently emerged in part because of its principals’ leadership in ground-breaking performances of photo-realistic digital humans in films, such as *Tron: Legacy* and *The Curious Case of Benjamin Button*, and in live music concerts, such as the 2012 Coachella Valley Music Festival, which featured the digital resurrection of late rapper *Tupac Shakur* as a ‘holographic’ performer.

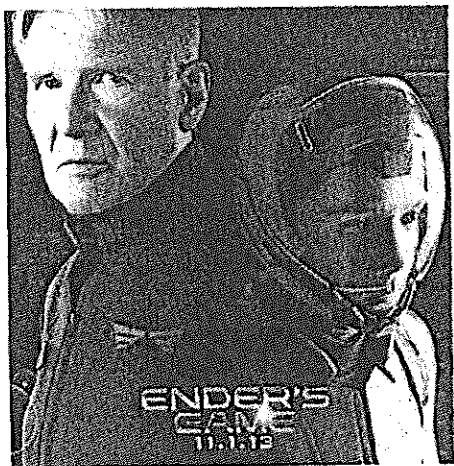
The Business - Pulse is leveraging its expertise, relationships and market position to develop, produce and exploit entertainment media in three distinct and complementary business verticals: *Pulse Productions*, *The Head Shop*, and *On-Point*. Common to all three divisions is the Company’s expertise in the development and production of story-based entertainment. However, each division focuses on distinct opportunities that represent significant areas of market growth in the entertainment industry:

- **Pulse Productions** – *IP Investments* – the investment and services division that focuses on the production of photo-realistic, digital likeness performers, representing the world’s top tier celebrities and late celebrities, for whom there is demand for live holographic performances in venues around the world. The resulting IP will be exploited in all media and markets worldwide. Pulse will derive revenues from two key activities: 1) the production of computer-generated celebrities and 2) the presentation of virtual celebrities on the variety of screens and stages available today.
- **The Head Shop** – *CG Services* – a services-only division that focuses on the production of photo-realistic, digital likeness performers, representing high impact late celebrities and world celebrities, whose associated celebrity estates can be enhanced by digital likeness appearances, but do not have the appropriate risk-reward balance to justify Pulse investment. In addition to celebrity performers, this division will also be willing to create animated human heads, fictional or otherwise, for use in feature films, commercials and branded entertainment.



Tupac Shakur - Pulse Chairman served as Chairman & CEO of VFX company that produced this digital resurrection and holograph-like performance in front of a live audience at the Coachella Valley Music Festival in 2012. Seen by more than 100 million viewers over YouTube, this media inspired demand from press worldwide for the digital return of many other late celebrities

- **On-Point – Branded Entertainment** – a division that brokers the Company's virtual performance productions and digital human production capabilities to top corporations and advertising agencies, enabling brands to exploit photo-realistic, digital likeness celebrities.



Ender's Game (2013), featuring Harrison Ford and Asa Butterfield

The Management – Pulse principals are known leaders in the entertainment industry, who are well positioned to exploit the demand for live and recorded branded and original entertainment. They have founded and operated successful production and media companies, produced large-scale feature films, worked with talent to launch lucrative careers, and overseen and produced some of the world's most visually stunning computer generated imagery. With collective senior visual effects experience in more than 50 major studio feature films, they also have Producer and Executive Producer experience in the development, finance and production of major market feature films, such as the recently released *Ender's Game* (directed by Gavin Hood, starring Harrison Ford); released in November 2013.

They are also globally recognized for their leadership of the most groundbreaking holographic, virtual performance projects known to date, including the digital resurrection of late rapper Tupac Shakur as a 'holographic' performer at the 2012 Coachella Valley Music Festival, and memorable performances of digital humans in the high profile feature films *Tron: Legacy* and *The Curious Case of Benjamin Button*.

John Textor, Executive Chairman of the Board - Former Chairman and CEO of Digital Domain, creators of holographic *Tupac* and digital characters for *Curious Case of Benjamin Button* and *Tron: Legacy*, and Producer/Executive Producer of *Ender's Game* (released November 2013).

Frank Patterson, Chief Executive Officer - A 25-year veteran of the entertainment industry who has served as a founder, CEO and/or President of several successful film and commercial production companies including Envisage Media Group, Inc., The Houston Cinema Group, Inc., and Red Hills Releasing, LLC, a feature film marketing and distribution company. Has directed and/or written seven feature films, shot more than 100 commercials and a variety of broadcast content. He serves as Dean of highly regarded Florida State University College of Motion Picture Arts.

Jim Berney, President and Head of Studio - Former Head of Studio at Digital Domain; Academy Award®-nominated visual effects supervisor at Sony Pictures Imageworks, responsible for supervision of notable films including *Green Lantern*, *I Am Legend*, and *The Chronicles of Narnia*, for which he was nominated for an Academy Award for Outstanding Visual Effects, *The Matrix Reloaded*, *The Matrix Revolutions*, *The Lord of the Rings: The Two Towers* and *Harry Potter and the Sorcerer's Stone*. Jim also served as CG supervisor for *Hollow Man* (2000 Academy Award® nominee, Best Visual Effects).

Funding Requirements – To successfully execute the business plan, Pulse Entertainment is seeking \$15 million in equity funding. During the first 2 years of operation – Pulse projects it will acquire the digital likeness rights for 3 Top Tier Celebrities, execute 2-3 high profile Top Tier Celebrity entertainment productions, and deliver numerous other revenue producing projects involving Second Tier Celebrities and Branded Entertainment.

KEYS TO SUCCESS

Pulse Entertainment intends to deliver the most visually stunning, globally recognized human animation and holographic performances in the entertainment industry. Pulse is uniquely qualified to succeed in a large, fast-growing market segment that its principals helped start.

Notable Company and Market Attributes Include:

- Global Audience for New Form of Entertainment
- High Margin Products/Services in High Growth Market
- Demand is Far in Excess of Industry Capacity
- Globally Recognized Innovators Lead Company
- Rights Acquisition Strategy Creates Competitive Barrier
- First to Market Leadership Position
- 'New Real Estate' in exploitation of likeness rights
- Opportunity for Multiple Streams of Revenue

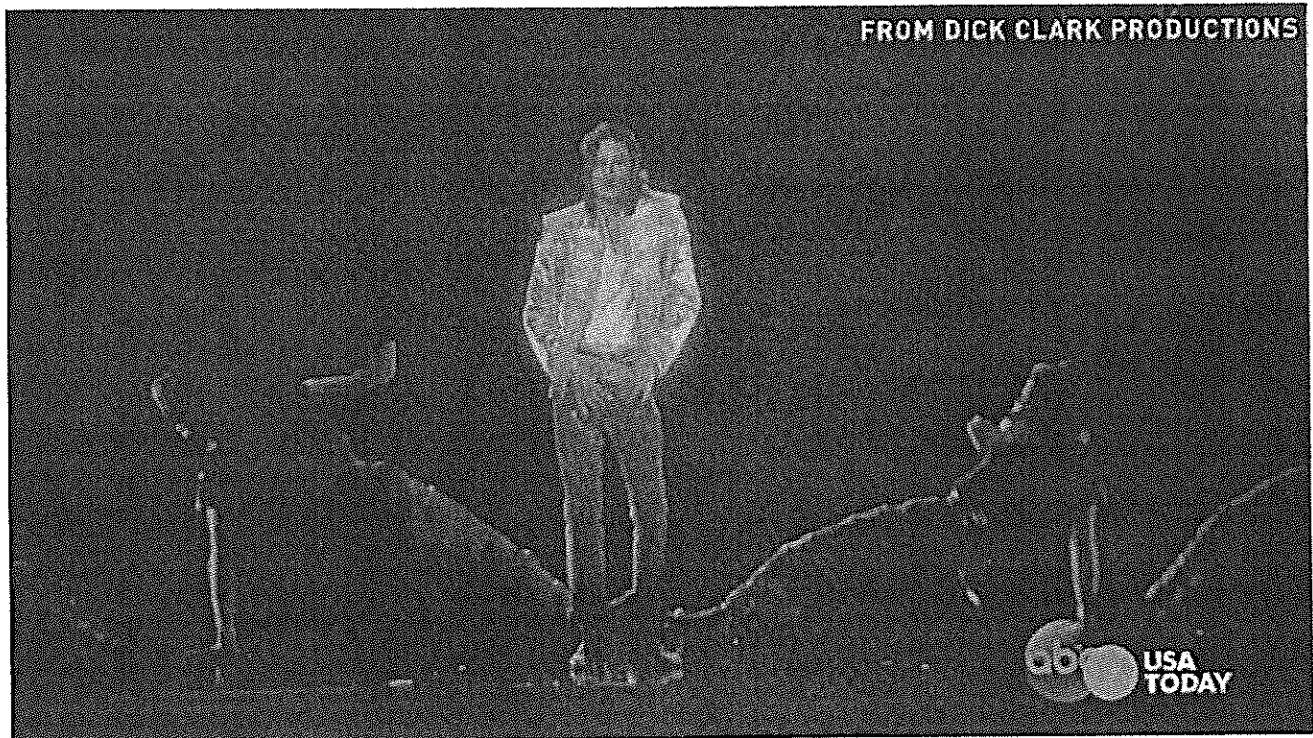
USE OF FUNDS

\$15MM in capital will be used for:

- | | |
|--|-------------|
| • Startup / Early Stage Capital Expenditures | \$2,500,000 |
| • 1 st Celebrity Digital Asset Construction | \$3,000,000 |
| • 2 nd Celebrity Digital Asset Construction | \$3,000,000 |
| • 3 rd Celebrity Digital Asset Construction | \$3,000,000 |
| • Working Capital & Contingency | \$3,500,000 |

EXHIBIT E

Meet the conjurers of Michael Jackson's ghost



Pulse Evolution, the digital firm that orchestrated Michael Jackson's "appearance" at the Billboard Music Awards, exclusively invited USA TODAY to its studios for a look at how the illusion was created. USA TODAY



Marco della Cava, USA TODAY 12:32 p.m. EDT May 23, 2014



(Photo: Getty Images for DCP)

SAN RAFAEL, Calif. — Michael Jackson came back to life last Sunday on the Billboard Music Awards telecast. And the team that orchestrated his high-tech resurrection is beaming through their fatigue.

"It scared us to death to create an image that had to look, feel and function for four minutes like an entertainer everyone in the world knows," says Frank Patterson, CEO of digital effects firm Pulse Evolution. "You have to see his eyes and moves and believe it was him."

WATCH: See the performance of 'Slave to the Rhythm' (<http://youtu.be/jDRTqhGZ7XU>)

MORE: Jackson mirage heralds future of posthumous shows (<http://story/life/music/2014/05/22/michael-jackson-mirage-heralds-future-of-posthumous-shows/9447595/>)

After a week of social and online media speculation about how the effect was pulled off, Florida-based Pulse exclusively invited USA TODAY to its Bay Area studios, located in the former headquarters of George Lucas' Industrial Light & Magic, to explain the details behind Jackson's performance of *Slave to the Rhythm*, off the late singer's new album, *Xscape*.

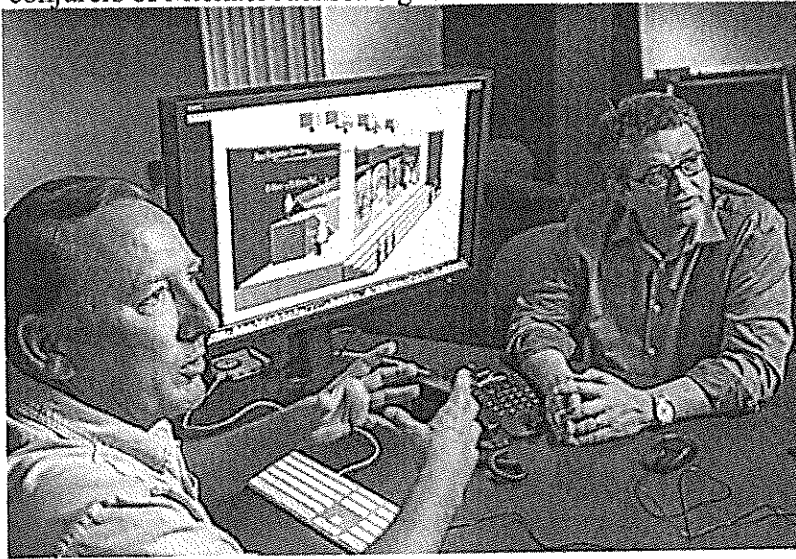
But first, a plea. "It's not a hologram," says Pulse Executive Chairman John Textor, sitting in the room where the Jackson effect was crafted with Patterson and visual effects supervisor Stephen Rosenbaum, who worked on *Avatar*.

So what is it? "An illusion," Patterson says.

Indeed, Pulse refined a 19th-century magician's technique called Pepper's ghost, which Textor — then leading Oscar-winning graphics company Digital Domain — also employed to summon the ghost of slain rapper Tupac Shakur at the Coachella music festival in 2012. The effect involves projecting an image on glass or plastic at a 45-degree angle, which brings that image into the viewer's field of view.

But the Jackson illusion was infinitely more complex to pull off. "Tupac had no hair, and just stood there, where Michael had to be all over the place," Patterson says.

Meet the conjurers of Michael Jackson's ghost



Pulse Executive Chairman John Textor, left, and CEO Frank Patterson discuss the creation of the Michael Jackson Illusion at the Pulse studio in San Rafael, Calif., on May 21, 2014. (Photo: Martin E. Klimek, USA TODAY)

Here's how things went down over eight long months of development.

Pulse first recorded *Slave*'s gilded backdrop and real dancers in staggering 8K resolution (4K TVs are state of the art), using two \$50,000 Red Dragon cameras. Next, a computer-generated Jackson circa 1991 (the period chosen by the Jackson estate) was subjected to an arduous animation process that was crucial to its success.

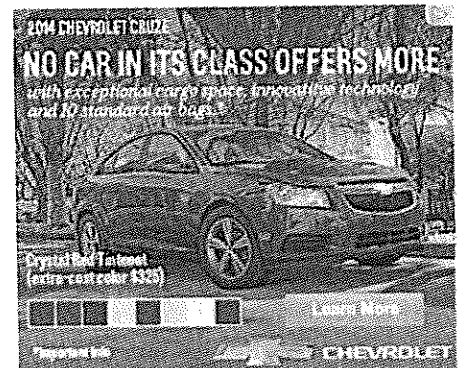
"You have to get across what's called the 'uncanny valley,' which says the closer you get to making a digital human real, the creepier it gets," says Patterson, adding that the illusion still lacked believability two weeks before the awards. "In the end, with all the intricate details in Michael's face and gestures, we feel we got across."

Come showtime, Pulse hung six high-powered projectors overhead and aimed the high-resolution footage of Jackson dancing and singing down at a piece of Mylar.

To the audience assembled at Las Vegas' MGM Grand, it looked as if a life-size Jackson was in front of them. The illusion was cemented by the presence of live dancers (foreground) and band (background).

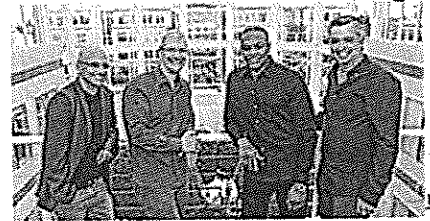
"When the people who knew Michael best started crying at the show, we knew we'd done something," Textor says. "Then we started crying."

Read or Share this story: <http://usat.ly/1nwOG8G>



USA NOW

Meet the conjurers of Michael Jackson's ghost



music-industry-usa-now/

May 29, 2014

THE GRAND ILLUSION

Audiences at Sunday's Billboard Music Awards ceremony were treated to a performance of *Slave to the Rhythm* by none other than the late Michael Jackson himself. Though widely mistaken as a hologram, the performance by Michael Jackson was the result of computer-generated images, live performers and a touch of illusion known as Pepper's ghost. Here's how producers mixed fantasy with reality:

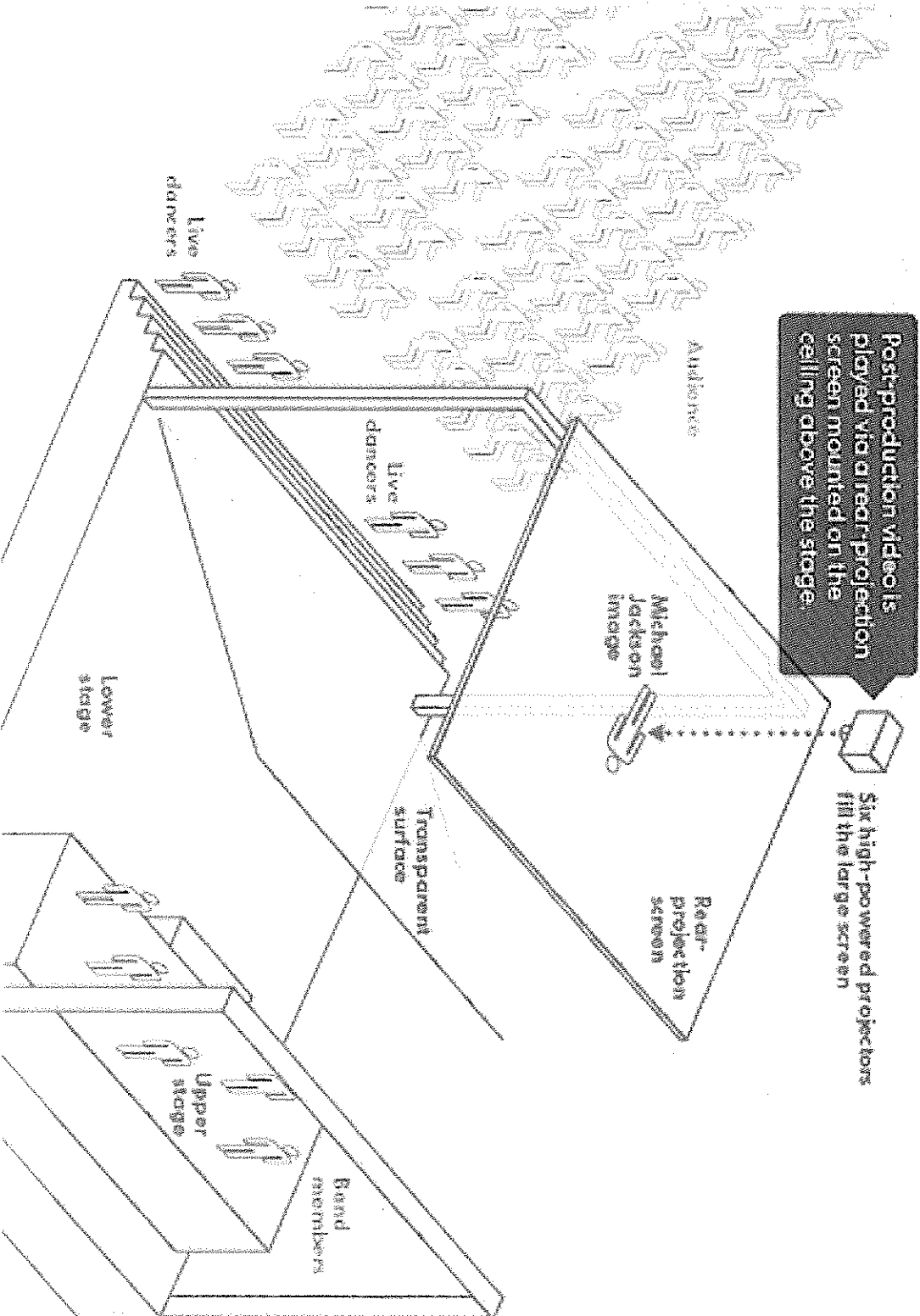
Source: Pulse Evolution

Frank Pompe, Anne R. Carey and Karl Gelles, USA TODAY

THE GRAND ILLUSION

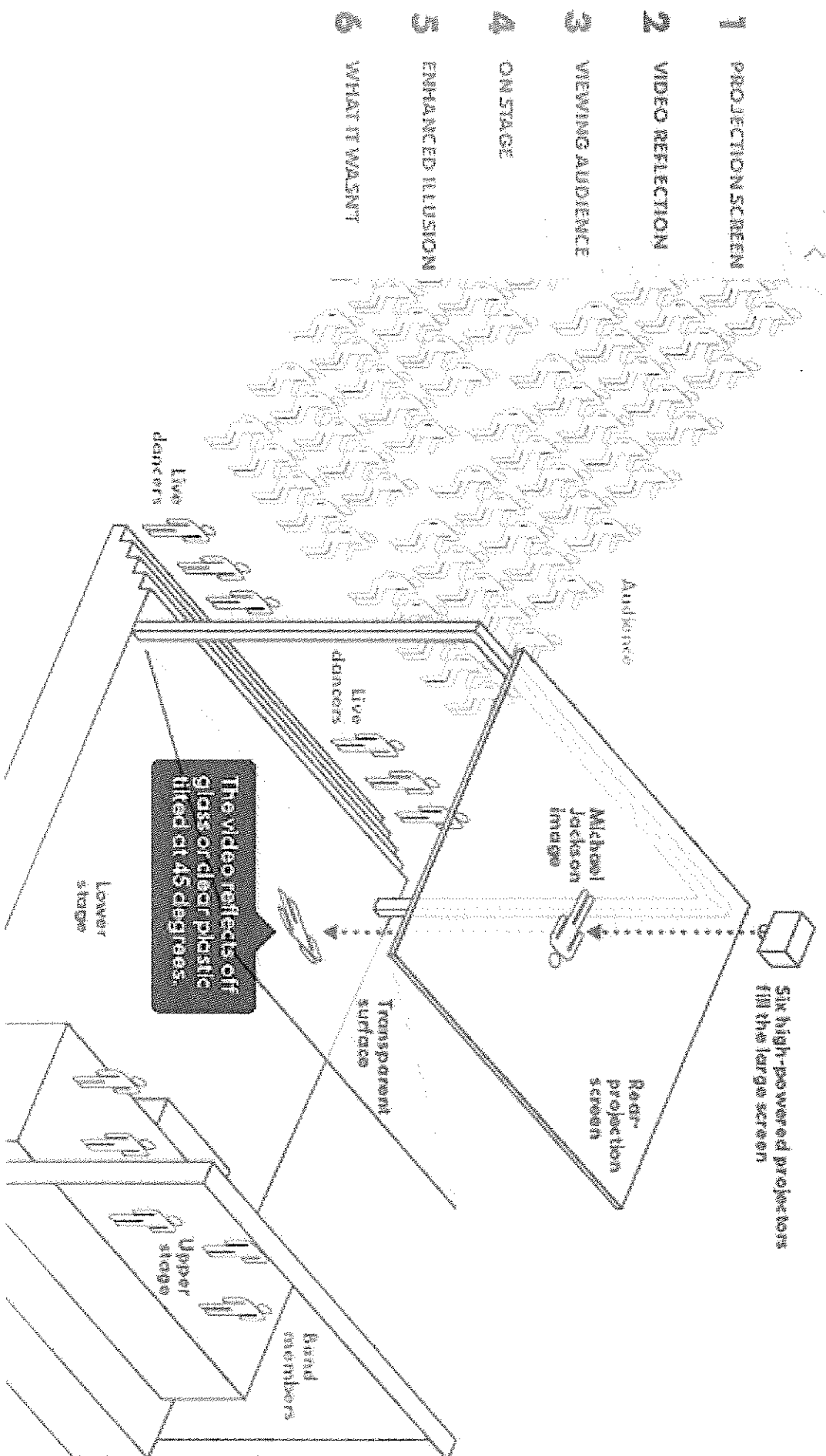
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- 1 PROJECTION SCREEN
- 2 VIDEO REFLECTION
- 3 VIEWING AUDIENCE
- 4 ON STAGE
- 5 ENHANCED ILLUSION
- 6 WHAT IT WASNT



THE GRAND ILLUSION

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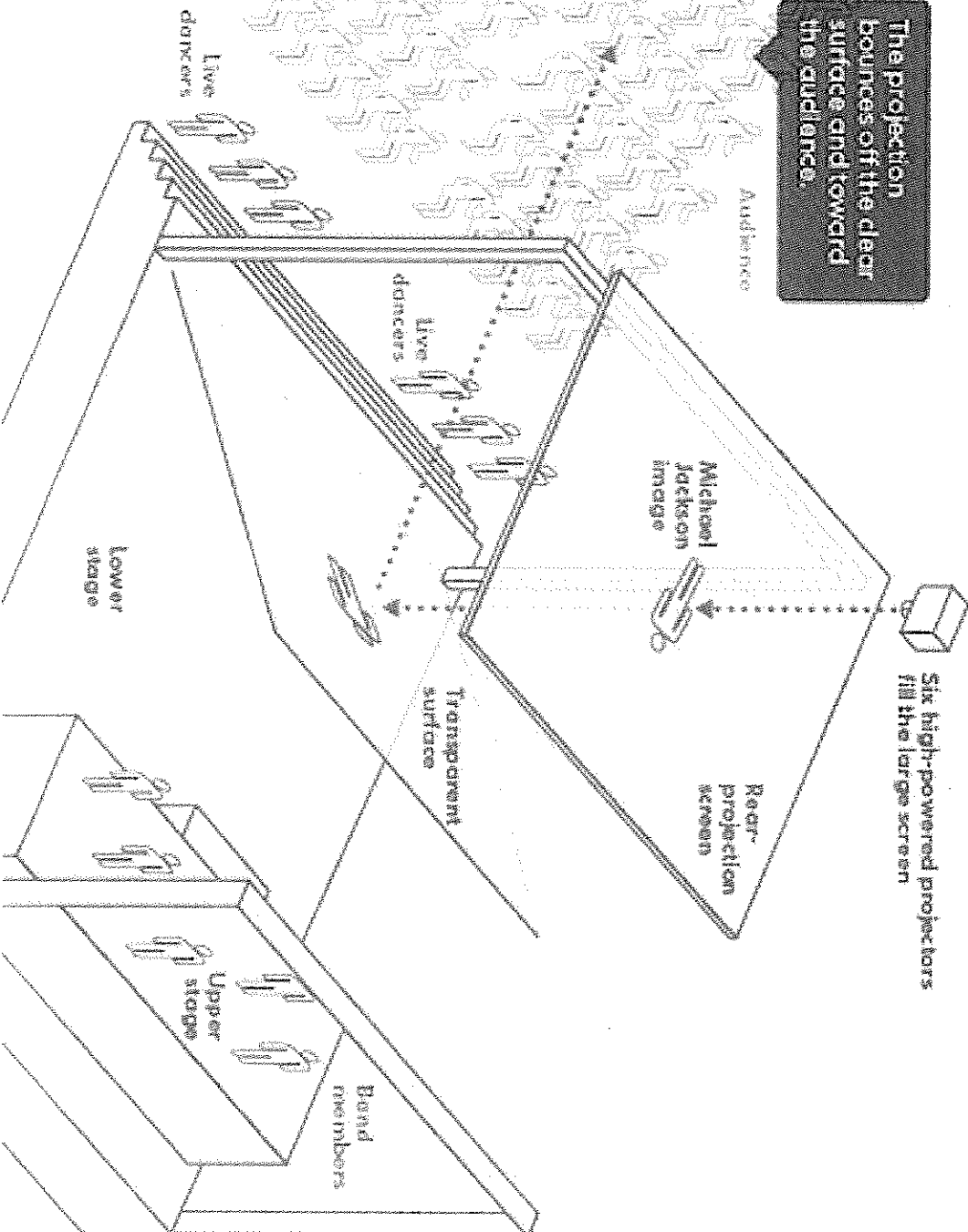


Source: Billboard Magazine
 www.billboard.com From Sunday, October 12, 2009

THE GRAND ILLUSION

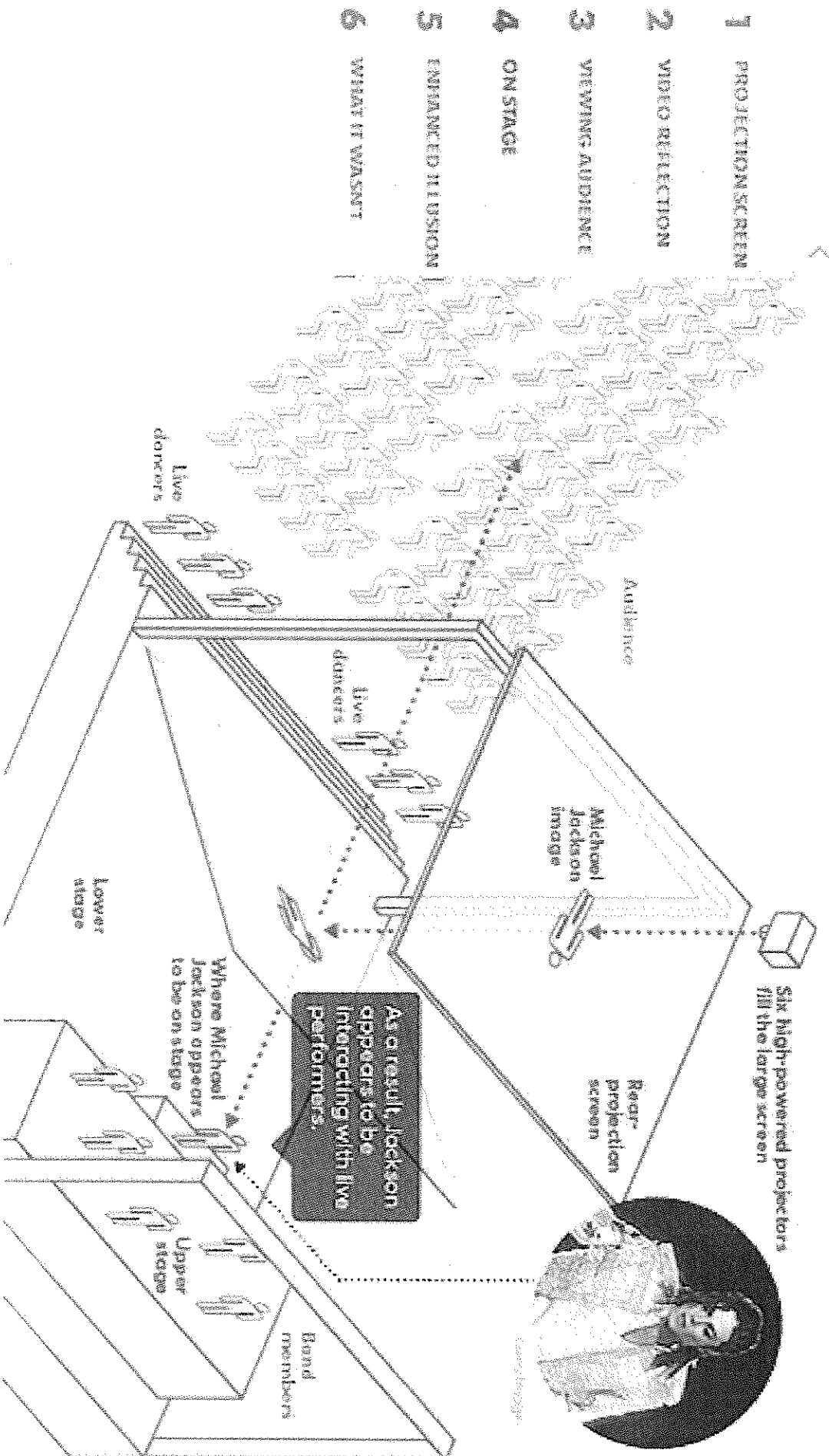
Audiences at Sony's Billboard Music Awards ceremony were treated to a performance of *Slave to the Rhythm* by none other than the late Michael Jackson himself. Though widely mistaken as a hologram, the performance by Michael Jackson was the result of computer-generated images, live performers and a touch of illusion known as Pepper's ghost. Here's how producers mixed fantasy with reality:

- 1 PROJECTION SCREEN
- 2 VIDEO REFLECTION
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- 5 ENHANCED ILLUSION
- 6 WHAT IT WASNT



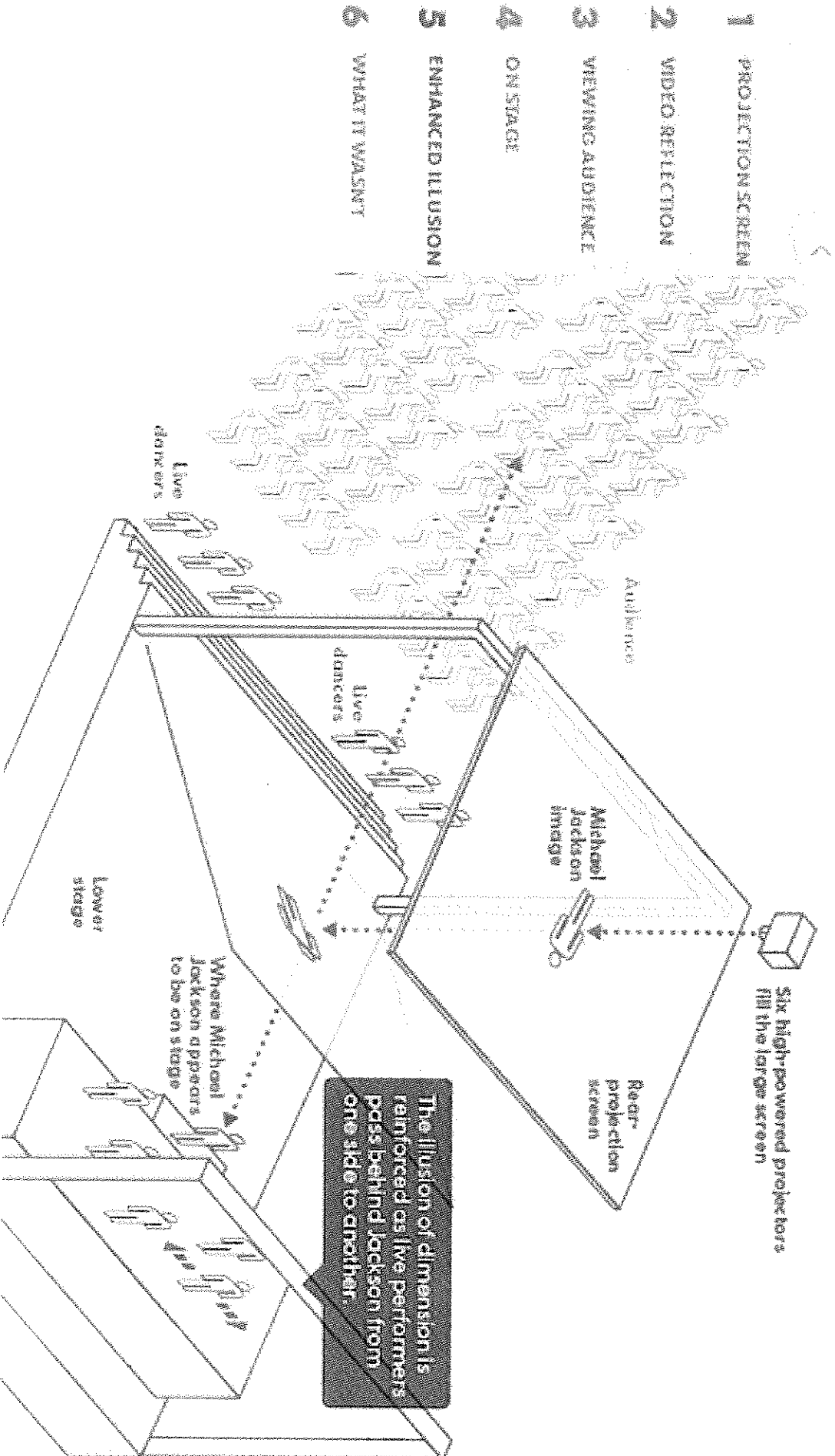
THE GRAND ILLUSION

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THE GRAND ILLUSION

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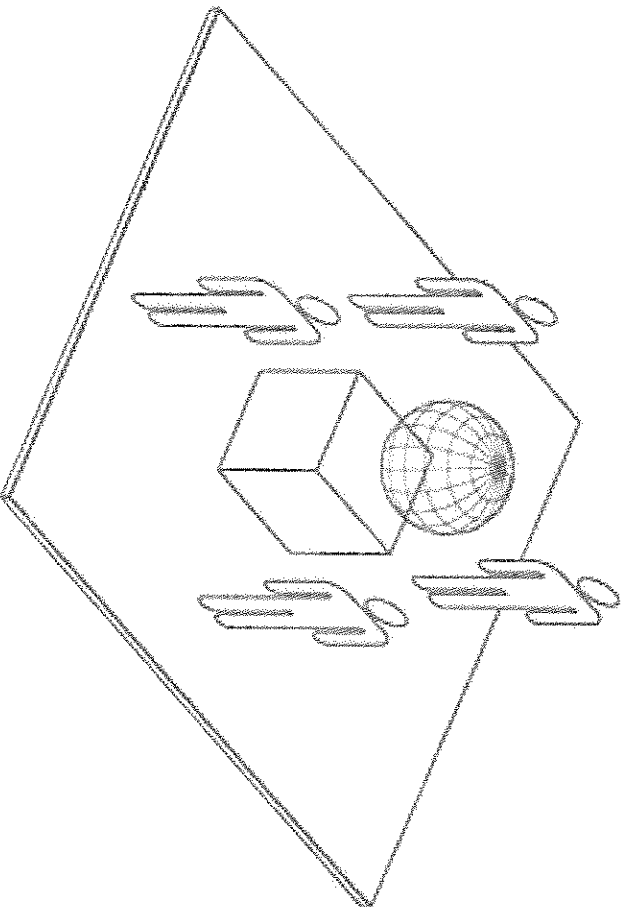
THE GRAND ILLUSION

Audiences at Sunbury's Billboard Music Awards ceremony were treated to a performance of Slave to the Rhythm by none other than the late Michael Jackson himself. Though widely mistaken as a hologram, the performance by Michael Jackson was the result of computer-generated images, live performers and a touch of illusion known as Pepper's ghost. Here's how producers mixed fantasy with reality:



WHAT IT WASN'T: HOLOGRAPHY

- 1 PROJECTION SCREEN
- 2 VIDEO REFLECTION
- 3 VIEWING AUDIENCE
- 4 ON STAGE
- 5 ENHANCED ILLUSION
- 6 WHAT IT WASN'T



Holography uses projections of lights in space to create an image in front of you that is completely viewable on all sides without 3D glasses. It creates the illusion of a three-dimensional image on a two-dimensional surface.

EXHIBIT F

glusercontent.com/search?q=cache:6KDjhdvKtVJ:www.musion3d.co.uk/&hl=en&gl=us&strip=0

Advance3 Ho...

MUSION 3D

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SERVICES

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The Magic of Musion 3D: Life-Size Interactive 3D Holographic Projection.

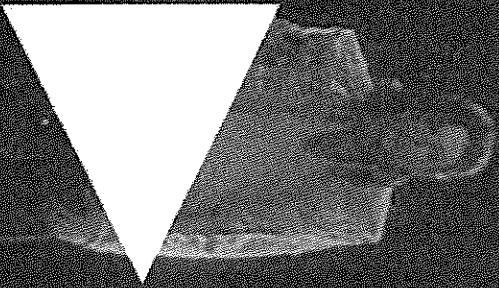
So now we can say it that Musion 3D was proud to have partnered in the production process with Pulse Entertainment since January 2014. The filming and dance sequences were shot on collaboration with Musion 3D using a proprietary 8K video production. The Foil used Musion proprietary fireproof foil and was rigged by Musion 3D. The production has been in rehearsals for many weeks. Musion 3D is not in any way connected with the company Musion Das Hologram

Info

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Michael Jackson - Slave To The Rhythm



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EXHIBIT G



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NOTE: Results display only for issued patents and published applications. For pending or abandoned applications please consult USPTO staff.

Total Assignments: 2

Patent #: 7883212 **Issue Dt:** 02/08/2011 **Application #:** 10599553 **Filing Dt:** 09/30/2006
Publication #: 20070201004 **Pub Dt:** 08/30/2007
Inventors: Ian O'Connell, James Rock
Title: PROJECTION APPARATUS AND METHOD FOR PEPPER'S GHOST ILLUSION

Assignment: 1

Reel/Frame: 018419/0258 **Recorded:** 10/21/2006 **Pages:** 5

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Assignors: O'CONNELL, IAN

Exec Dt: 09/08/2006

ROCK, JAMES

Exec Dt: 09/11/2006

Assignee: MUSION SYSTEMS LIMITED

7A LANGLEY STREET
COVDEN HOUSE
LONDON, UNITED KINGDOM WC2H 9JA

Correspondent: DR. MATTHIAS SCHOLL, ESQ.
14781 MEMORIAL DRIVE
SUITE 1319
HOUSTON, TX 77079

Assignment: 2

Reel/Frame: 031615/0800 **Recorded:** 11/11/2013 **Pages:** 12

Conveyance: ASSIGNMENT OF ASSIGNORS INTEREST (SEE DOCUMENT FOR DETAILS).

Assignor: MUSION SYSTEMS LIMITED

Exec Dt: 09/26/2013

Assignee: MUSION DAS HOLOGRAM LIMITED

90 HIGH HOLBORN
LONDON, UNITED KINGDOM WC1V 6XX

Correspondent: MICHAEL S. TUSCAN
1299 PENNSYLVANIA AVE., NW
SUITE 700
WASHINGTON, DC 20004-2400

Search Results as of: 06/27/2014 01:06 PM

If you have any comments or questions concerning the data displayed, contact: PRD / Assignments at 571-272-3350. v.2.4

Web interface last modified: Mar 15, 2014 v.2.4

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EXHIBIT H

Scott Malzahn

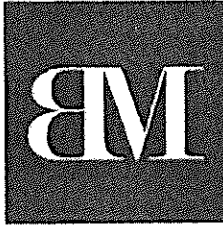
From: Janice Lee
Sent: Thursday, May 15, 2014 6:21 PM
To: John.textor@pulse.co; johnb@ziffrenlaw.com; jmccclain2004@aol.com; hweitzman@kwikalaw.com; Jessica.Letskemann@billboard.com; Andrew.min@billboard.com; jjames@dickclark.com
Cc: Ryan Baker; Scott Malzahn
Subject: Notice of Intention to Seek Temporary Restraining Order/Request for Stipulation (Federal Rule of Civil Procedure 65 and Nevada Local Rule 7-5)
Attachments: 5-15-14 Cease and Desist Letter re Billboard Awards (00070552).PDF

Dear Mssrs. Textor, Branca, McClain, Hweitzman, Min, James, and Ms. Letkemann:

Please see the attached correspondence, sent on behalf of Mr. Ryan G. Baker.

Regards,
Janice Lee

Janice Lee
Legal Assistant
BAKER MARQUART LLP
10990 Wilshire Blvd., Suite 400
Los Angeles, CA 90024
Phone: (424) 652-7800
Fax: (424) 652-7850



BAKER MARQUART^{LLP}
ATTORNEYS

WRITER'S DIRECT DIAL NO.
(424) 652-7801

WRITER'S E-MAIL ADDRESS
rbaker@bakermarquart.com

May 15, 2014

Via Electronic Mail

John.textor@pulse.co; johnb@ziffrenlaw.com; jmcclain2004@aol.com;
hweitzman@kwikalaw.com; Jessica.Letkemann@billboard.com; Andrew.min@billboard.com;
jjames@dickclark.com

**Re: Notice of Intention to Seek Temporary Restraining Order/Request for Stipulation
(Federal Rule of Civil Procedure 65 and Nevada Local Rule 7-5)**

Gentlemen:

I represent Hologram USA, Inc. ("Hologram USA"), which has licensed the exclusive right to exploit the Musion Eyeliner technology ("Eyeliner") throughout the United States and Canada.

As you undoubtedly know, Eyeliner is protected by United States Patent Nos. 5,865,519 (the "519 patent") and 7,883,212 (the "212 patent") (collectively, the "Patents"). Mr. Uwe Maass and Musion Das Hologram Limited ("MDH") hold these Patents, which Hologram USA has exclusively licensed in the United States and Canada. I also represent Mr. Maass and MDH.

I have recently learned that you have planned to display a holographic image of Michael Jackson at the May 18, 2014 Billboard Music Awards. Billboard.com advertises the Michael Jackson performance as a "World Premiere Experience" and states that "[t]he Estate of Michael Jackson created the spot, which will present the superstar 'like you've never seen him before.'" Based on prior communication between John Textor and my clients, it is apparent that you intend to utilize Eyeliner technology for this "world premiere event."

You have absolutely no right to utilize Eyeliner technology at the Billboard Music Awards or anywhere else. Because you have already publicized your planned infringement, you have already irreparably harmed Hologram USA, Mr. Maass and MDH. If you persist in your plans to infringe the Patents by displaying the hologram during the May 18 Billboard Music Awards, the irreparable harm to my clients will be significantly greater. Accordingly, I demand you agree to refrain from displaying any Michael Jackson hologram during the May 18 award show. If you will not enter into such an agreement, my clients will be forced to seek court intervention.

Specifically, unless I hear, by 8 p.m. Pacific, on May 15, 2014, that you agree not to display any Michael Jackson hologram during the May 18, 2014 Billboard Music Awards, my clients will file an action in Nevada District Court seeking damages for patent infringement; my clients will also seek a temporary restraining order and other appropriate relief. As you undoubtedly know, in addition to awarding attorneys' fees, a court may triple the amount of damages in the case of willful infringement. In this case, there will be no doubt that your infringement is willful.

This letter is not intended to waive any of my clients' rights. Further, this letter does not purport to be a full or complete statement of the facts or the law and is without prejudice to any rights, claims, and remedies available to Hologram USA, Mr. Maass or MDH, whether legal or equitable in nature, all of which are expressly reserved.

I look forward to hearing from you promptly.

Please free to contact me if you have any questions or concerns.

Regards,

A handwritten signature in black ink, appearing to read 'Ryan G. Baker', with a stylized, looping initial 'R'.

Ryan G. Baker